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Association Between Type of Diabetes Education and Health Status, Limitations, and Healthcare

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This is to certify that the doctoral dissertation by

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2018

Abstract

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Starr Michelle Seip

MS, Marywood University, 2005

BS, Mansfield University, 1991

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

Diabetes is an epidemic that has started to capture political attention in the United States because of the devastating health care costs associated with the disease. Researchers in other studies have concluded that additional education face-to-face (FTF) and FTF with alternative forms of diabetes communication (FTF plus) have been beneficial. However, there is very little information on the comparison of the two groups as mentioned above when comparing chronic limitations, self-perception, health status, and healthcare satisfaction as circumscribed by specific demographic population. This study was an investigation of the above variables and explored how specific demographic characteristics (age, gender, educational level, and race/ethnic background) may have an identifiable association with each diabetes education type, either FTF or FTF plus. This research involved the use of the social cognitive theory and the health belief model to help explain self-care behavior changes. This quantitative, cross-sectional study used secondary data from the 2016 National Health Interview Survey for analysis. A simple linear regression was used to understand health status and healthcare satisfaction. A logistical regression was used for chronic limitations, while controlling for demographics for all the variables. The study revealed FTF plus had an association with chronic limitations with race and education level, but age was not significant. After controlling for demographics, a person who has FTF plus has decreased odds of having chronic limitations, in comparison to someone who receives only FTF. The results from this study may aid formulation of future healthcare policies that focus on how to refer patients to multiple forums of diabetes education, while reducing healthcare costs.

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Dedication

I would like to take this opportunity to thank my husband Timothy D. Seip and Elisa S. Seip for supporting me during my dissertation process. I would also like to thank other individuals for finding the time to support my efforts: Claire Freeman, Jacob Albright and Tina Albright.

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I would like to acknowledge my family and employer for supporting my efforts in pursuing my dissertation. Quintiles management helped tremendously with by financing my dissertation to better support the company’s overall mission. Without my friends, family and employer, my dissertation may not ever have been completed.

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Chapter 1: Introduction to the Study

Diabetes is a serious epidemic in the United States. According to the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention [CDC], 2014a), over 29.1 million people in the United States have diabetes, about 9.3% of the population. About 8.1 million of them are undiagnosed. Type 2 diabetes mellitus (T2DM) requires early intensive management to keep patients' glycated hemoglobin (A1C) levels below 7%, which prevents the onset of diabetes related complications (CDC, 2014a). These complications could be minimized by educating the patient about managing their diabetes (American Association of Diabetes Educators [AADE], 2008; American Diabetes Association [ADA], 2016). The best way for a participant to manage his or her diabetes is to meet with a Health Care Provider (HCP) and an educator regularly (American Association of Diabetes Educators [AADE], 2008).

Background of the Study

Diabetes Prevalence

According to the CDC (2014a) from 1980 to 2012, the number of people diagnosed with diabetes in the United States quadrupled. The numbers went from five and a half million diagnosed with diabetes to 21.3 million diagnosed with diabetes (CDC, 2017). Every year there are nearly two million new cases of diabetes among the adult population. The CDC (2017) estimated if the trend continued by the year 2050, 1 out of 3 adults in the United States would have diabetes.

There are about 200,000 deaths that occur among the people with diabetes in the United States. In the year 2013, diabetes was the seventh leading cause of death. The

CDC (2017) also stated there were an additional 86 million U.S. adults who have prediabetes. It was important to identify people with prediabetes because they were at an increased risk for developing T2DM, stroke, and heart disease.

Rates of prediabetes and T2DM are increasing because the rates of obesity, unhealthy diet, lack of physical activity, and low socioeconomic factors are also rising (CDC, 2017). T2DM is associated with poor blood sugar control, elevated blood cholesterol, and elevated blood pressure. Longer life spans, obesity, and diabetes have combined to increase risk of diabetes by 40% among U.S. adults over the last 20 years (CDC, 2017). Non-Hispanic Black women and Hispanic men and women are predicted to develop the disease, 50% more than non-Hispanic White individuals (CDC, 2017).

Cost of Diabetes

In 2012, the total direct and indirect costs for diabetes in the United States totaled $245 billion dollars. Direct medical costs were $176 billion (CDC, 2017). To adjust for the age of the population and sex difference, the average medical expenditures with people who had diabetes was 2.3 times higher compared to the person did does not have diabetes. The indirect costs disability, premature death, and work loss was $69 billion (CDC, 2017).

According to the CDC (2014a), between the years of 2010-2012, there were 2.9 million adults diagnosed with diabetes. Adults using insulin and diabetes medication equated to 14.7% of the diabetes population. Thus, there was about 56.9% of the diabetes population who were on oral medication to control their diabetes, while 14.4% of the diabetes population used neither insulin nor oral medication (CDC, 2014a). The remainder of the diabetes population may be treated with a Glucagon-Like-Peptide (GLP-agonist), which is an injectable medication (CDC, 2014a).

Diabetes Morbidity and Mortality

Diabetes is a major contributor to heart disease and stroke, which have been included in the top 10 causes of disability worldwide (CDC, 2014a). The modified risks for developing T2DM include overindulging or poor nutrition, physical inactivity, and obesity (CDC, 2014a). When diabetes is untreated, undiagnosed, or poorly controlled, it causes destructive irreversible complications, such as kidney failure, visual impairment, blindness, heart attack, lower limb amputation, stroke, and erectile dysfunction (CDC, 2014a). These medical conditions develop because of persistent hyperglycemia and other factors, such as lipid disturbances, high blood pressure, and obesity (CDC, 2014a). "Every seven seconds someone somewhere dies from diabetes. This statistic alone accounts for four million deaths globally each year" (CDC, 2014a, para. 2). Self-management education is the key to assist people with diabetes because they must make multiple decisions every day about balancing food, physical activity, and medication, including blood sugar monitoring and insulin injections (AADE, 2008).

Reason for Traditional Face-to-Face (FTF) Education

Individuals who are diagnosed with diabetes need self-management skills to take care of themselves to understand how diabetes affects their own health outcomes (Ryan, Schwartz, Jennings, Fedders, & Vittoria, 2013). In conjunction with these self-management skills, individuals with diabetes have to perceive that they are capable of taking care of themselves by taking the steps to diabetes self-management; in other words, they need self-efficacy. Self-efficacy is measured by the level to which an individual has the confidence to implement behavioral changes based on outcome expectations and efficacy beliefs (Ryan et al., 2013). It is recommended by the American Diabetes Association that individual self-management skills be taught to the individual by a HCP or a Certified Diabetes Educator (CDE) shortly after diagnosis, so the individual understands the benefits of self-management for better health outcomes (ADA, 2016).

Rates of diabetes mellitus are growing all over the world. *Clinical inertia* is also becoming an issue. Clinical inertia is the failure to intensify treatment of a patient who is not at their A1C goal (Mohan, Shah, & Saboo, 2013). The A1C test measures a person's average blood glucose level over the past 2 to 3 months. Hemoglobin is the part of a red blood cell that carries oxygen to the cells and sometimes joins with glucose in the bloodstream (Mohan et al., 2013). In addition, the test shows the amount of glucose that sticks to the red blood cell, which is proportional to the amount of glucose in the blood.

T2DM is a progressive disease; the beta cells in the pancreas decrease the amount of insulin it produces every day, and typically insulin begins when oral medications or GLP-agonists are no longer keeping the A1C below 9%. Ideally, an A1C must be maintained below 7% to have decreased complications (ADA, 2016).

This Mohen et al., 2013 study was an observational study of people with T2DM using insulin in the clinics in India. The purpose of this study was to see the extent of diabetes related complications and blood sugar status in T2DM in India. Yet, researchers stated that physicians hesitated to start insulin because they worried about the patient giving daily injections, modification of lifestyle due to insulin, and the dependence on insulin for life (Mohan et al., 2013). Then, the patient believes it is the last stage of diabetes which may be related to an increase in complications, and increase in mortality (Mohan et al., 2013). Mohan et al. (2013) emphasized the need for extensive education for the patients and the physicians. The researchers in this study stated there was little interaction with many patients due to decreased access to healthcare; thus, there was an increased need for more alternative forms of education through emails, phone calls, and similar methods.

The A1C test has been the gold standard for health outcomes, but there have been noted flaws with the A1C alone to determine health outcomes (ADA, 2016). The A1C may be affected significantly if the person has severe kidney disease, sickle cell anemia, or various blood diseases. Most studies did not have an accurate measurement for some ethnicities, because the studies did not always consider different ethnicities having a need to learn self-management skills through alternative forms of communication (Handelsman & Warshaw, 2016).

Currently, clinicians do not have an alternative education program for the best glucose control based on a patient's background. Education on self-care behaviors would improve a patient's A1C. A HCP would use an A1C in the past to understand how well the patient's blood sugar had been controlled over the last 3 months (ADA, 2016). Another purpose of checking the A1C might be to understand if the patient's medication was working. The A1C lab value by itself does not show if the patient is taking the medication accurately or even understands the reason for taking the medication. When studying patient health outcomes, most researchers did not observe self-management education and support with medication usage. Handelsman and Warshaw (2016) posit that the FDA should not allow studies to take place without having a self-management therapy with glucose-lowering medications.

A1C alone does not address how a person understands the need to perform the self-care management skills or predict if the patient has been educated on why they need self-management skills. The self-management basic skills must be taught FTF for the patient to receive feedback on whether the skills are performed correctly (AADE, 2008). The self-care behaviors include healthy eating, being active, blood sugar monitoring, taking medication correctly, problem-solving, healthy coping, and reducing risk (ADA, 2016). A diabetes patient manages all these behaviors. The different behaviors were addressed differently over my diabetes study because of medication changes, progression of diabetes, and complications of diabetes.

Barriers of FTF Education

Although organizations such as ADA and AADE identified early education for diabetes management as an essential need to generate better health outcomes, several barriers prevent the HCP from placing a referral for education or giving the patient more options for diabetes education (AADE, 2008; ADA, 2016). As an example of these barriers, when the HCP recommends the individual be referred to an outside educator, the lack of continuity in care may create fragmented care because the follow-up documentation may not always be charted in a timely manner (Suralert et al., 2011). When an individual is referred to a CDE, which happens about 50% of the time, the providers refer the participant for specific reasons: a complex dietary issue other than a medical issue, a carbohydrate counting instruction, the individual’s difficulty in losing weight, or the initiation of insulin injection (Maine Center for Disease Control and Prevention and Maine Department of Health and Human Services, 2006). The HCP refers an individual to a diabetes self-management education (DSME) program at diagnosis, which involves annual assessments of educational, nutritional, and emotional needs, when complicating factors influence self-management in transitions of care (Powers et al., 2015). Unfortunately, a patient who never receives a referral from a physician may seek information from unreliable resources (Powers et al., 2015).

Alternative Forms of Communication (Education)

Powers et al. (2015) identified some of the reasons for an HCP not referring a patient to an education program. These reasons were the individual’s health-related stigma related to diabetes, no alternatives to the traditional group education format, the time required to go to traditional education sessions, and the HCP may not have told the patient about alternative diabetes education (Maine Center for Disease Control and Prevention and Maine Department of Health and Human Services, 2006). There was limited literature that addressed credible alternative Internet-based education, phone calls, emails, or texts and how the traditional sessions influenced the patient’s quality of life (QoL; Rosal et al., 2014). Health related QoL may be quantified as overall satisfaction with life or a sense of personal psychological, physical, and social well-being in a person expressing self-determination, satisfaction, and independence of control of disease processes (Paraskevi, 2013) HCPs need more options for support in order to teach the individual diabetes management skills for better QoL.

The HCP must educate the individual about reliable resources to ensure the patient receives valid and reliable information. Social media and websites have become popular among all Internet users; about 80% of users have proactively searched for health solutions (e.g., treatments for a specific disease) online (Lu, Zhang, Jingfang, Li, & Deng, 2013). Among this group, 34% have researched blogs, specific communities, and/or websites focusing on specific health issues (Lu et al., 2013).

Education is a must in all avenues of communication in order to adapt diabetes self-management to the adult low-income population. The cost of education could be a direct link in the decreasing the health outcomes for low-income diabetes patients (Ryan et al., 2013). In one study in which the participants had low incomes, only 22% of them had health insurance; their diabetes education was supported by frequent chat messages, which were free (Ryan et al., 2013). These frequent chat sessions improved the HCP-patient relationship, and the patient had better health outcomes (Ryan et al., 2013). Free web-based interventions (not including telehealth or telemedicine), chat messages, text messages, or even emails have the potential to bridge the gaps in diabetes care and self-management (Yu et al., 2012).

Barriers of Alternative Forms of Communication (Education)

Both telehealth and telemedicine options exist, but neither one is offered at no cost to the patient. Telemedicine provides medical information that is exchanged via electronic communication between two facilities to improve the health status of a patient.

This electronic communication uses several applications, including email, two-way video, wireless tools, and numerous other forms of technology (American Telemedicine Association, 2015). Telehealth uses technology and electronic information to facilitate better professional health education, public health, and clinical health care (HealthIT.gov, 2015).

A broader scope of nonclinical services and training for remote services distinguish telehealth from telemedicine (HealthIT.gov, 2015), but both forms of information exchange are quality services usually attached to an HCP or a health care facility. Telemedicine and telehealth have become popular in the last couple of years. However, the services are charged to a person’s insurance and are usually scheduled with a health care professional (Department of Health and Human Services, 2015).

Alternative Forms of Communication (Education) Without Barriers

There are numerous free online diabetes educational sites that individuals can access without worrying about insurance or a two-way teleconference video (Joslin Diabetes Center, 2015; Sanofi Diabetes, 2013). Researchers confirmed that there were no differences in diabetes health outcomes between the years 2001 to 2007 based on the venue (FTF, web-based, email, or texts) from which patients received their diabetes education (Dellifraine & Dansky, 2015). Additionally, researchers linked improved health outcomes, such as improved A1C and self-management skills, to increased interaction through mobile phone-based video messages (Bell, Fonda, Walker, Schmidt, & Vigersky, 2012).

In reference to providing participants positive outcomes using alternative forms of communication or education (emails, texts, chat rooms, phone calls, or social media), there are also area-based measures of segregation and isolation that do not directly assess racial attitudes in a geographic area. Internet search-based proxies of underlying population attitudes can be useful in examining beliefs and actions that are not socially sanctioned (Yu et al., 2012). The largest barrier in utilizing the Internet to assist healthcare professionals in the treatment of a specific disease is the HCP has limited knowledge regarding the effectiveness, usability, and attrition rates of the alternate forums of communication available to patients (Yu et al., 2012). Alternate forums of communication need to be explored to improve participants' health outcomes and self-perception health status, satisfaction with healthcare, or chronic limitations related to diabetes.

Quality of Life (QoL) or Chronic Limitations

QoL has several definitions; generally, it measures how well a patient can perform the activities of daily living (ADLs) without any assistance or significant physical pain or mental anguish. Diabetes can significantly impact a person's health and decrease his or her ability to complete these daily activities, consequently decreasing QoL (Cusack, Asyo, Frost, O'brien, & O'kane, 2008). When a patient needs more assistance with ADLs, both the costs of living and health care will rise. Thus, the increased costs of having diabetes can hinder the full potential of having a high QoL.

Health Status

Self-reported health status among people with T2DM may decrease more compared to non-diabetes patients. In fact, researchers stated that T2DM respondents had twice the decline compared to the patients without diabetes over 5 years (Grandy & Fox, 2012). Diabetes complications made more of a negative impact on the health status due the increased economic burden. The patient's glucose control, such as the A1C, was not collected in the treatment satisfaction for high blood pressure and diabetes surveys (Grandy & Fox, 2012). The participant taking the study did not indicate how many times the patient interacted with their HCP FTF or alternative forms of communication (education). The study did indicate if they were on oral medications, insulin, or both but did not cross reference if either one had a decrease in decline in health status.

Healthcare Satisfaction

Researchers examined the correlation between preventive healthcare and patient satisfaction with their HCP when using more communication technology, also known as technical care quality (Jerant, Fenton, Bertakis, & Franks, 2014). Jerant et al.'s (2014) participants responded to questions over 1 to 2 consecutive years to explore the association between a patient's satisfaction with the care they received from their HCP and adherence to preventive care. Technical care quality was identified in the outpatient setting. Technical care quality was clearly an item that had significant effect on the responses, but the technical care quality was not defined in Jerant et al.'s study. Jerant et al. addressed different aspects of exploring the association between the satisfaction with the HCP and preventative care adherence. The participants taking the questionnaire asked demographics, chronic disease, type of health care insurance, self-reported health status, and disposition toward skepticism and medical care. The results of Jerant et al.'s study showed there was more research needed with technical care quality in the outpatient setting. Technical care quality could refer to alternative forms of communication to receive information from the HCP. Thus, the additional amount of alternative communication might assist the participant to have better satisfaction with their chronic disease, such as diabetes mellitus.

Problem Statement

According to 2012 Standards Revision Task Force (2014), diabetes is on the rise. Diabetes has become one of the greatest health epidemics to affect contemporary society. According to the CDC (CDC, 2014), over 29.1 million people in the United States have diabetes, which is about 9.3% of the population. About 8.1 million of these cases are undiagnosed (CDC, 2014). Due to the increase in diabetes, individuals with diabetes need to be educated on how to manage diabetes correctly, in order to decrease the complications.

Evidence supporting the influence of viable education on diabetes includes providing (a) accurate information, (b) timely information, and (c) cultural sensitivity to improve diabetes self-care management skills, improve QoL, and better blood sugars (ADA, 2014). T2DM requires early intensive management in order to keep patients' glycated hemoglobin (A1C) levels below 7%, which prevents the onset of diabetes related complications (Center for Disease Control Prevention MMWR, 2014). Educating patients on more effective diabetes management techniques could help minimize these complications (ADA, 2016). The best way for a patient to manage his or her diabetes is to meet with an educator regularly. Multiple types of diabetes education are available from FTF to FTF with support of other technology. Individuals with diabetes may receive multiple types of education and their chronic limitations, self-perception of health status, or healthcare satisfaction for non-insulin and insulin dependent participants may change depending on the type of diabetes education and their demographic groups (age, sex, education, and ethnic background). However, few published studies have addressed all of these components. Addressing these components comprehensively may lead to better health outcomes.

Patients diagnosed with diabetes receive diabetes education from multiple sources aside from traditional FTF education sessions with a health care professional (HCP). These sources include the use of the Internet and multiple forms of communication including texts, chat rooms, or phones calls which may assist or enhance FTF diabetes education (Lu et al., 2013). Many participants with diabetes are studied using multiple social media applications and online activities; these might be their primary source of education when their HCPs are not accessible. It has been noted that there are numerous barriers to receiving FTF education (Burke, Sherr, & Lipman, 2014). The increased opportunity for Internet usage, text, social media outlets, and phone calls may help overcome the barriers for education. Currently there is little number of researchers that has studied the use of technology to overcome barriers to diabetes treatment. Alternative forms of communication (websites, texts, phone calls, and social media) are available and may have an impact on health outcomes with some or all demographic groups seeking diabetes treatment (American Diabetes Association, 2016). Current self-perception of health status, chronic limitations, and satisfaction with healthcare are not known to change in the virtual world setting when FTF is complemented with additional support from technology (Rosal et al., 2014). Few published studies address self-perceived health status, chronic limitations and healthcare satisfaction for non-insulin dependent and insulin dependent patients with various demographic characteristics (age, sex, education level, and ethnic background). There are few studies that differentiate between diabetes patients who are insulin dependent and those who are not when examining healthcare satisfaction. Even fewer studies address diabetes participants' use of FTF communication and FTF communication supplemented with alternative forms of communication.

Purpose of the Study

In this quantitative, cross-sectional study, I used secondary data from the National Health Interview Survey (NHIS) 2016. Purpose of this study was to determine if there is a difference in the association between diabetes communication type (FTF diabetes communication verses FTF with support of an alternative form of education including texts, chat rooms, and emails) and chronic limitations, self-perception of health status, and satisfaction with healthcare for non-insulin dependent and insulin dependent diabetes participants. Additional analyses were conducted to compare any associations between type of diabetes communication utilized and demographic characteristics (education, age, gender, and race/ethnicity).

The analysis among the participants in the study explored relationships among the multiple measurable variables (captured in the 2016 NHIS), diagnosis of diabetes, communication variables with Health Care Professional's (HCP), and various demographic groups. The sample reflected participants with self-reported diabetes and the dependent variables of satisfaction with healthcare, non-insulin dependent and insulin dependent, self- perception of health status, and chronic limitations. The independent variables were the different forms of communication with an HCP additional covariate and included age, education, race/ethnic background, and sex. This research represented an important step in addressing an issue that will have a significant impact on future health initiatives. This information may ultimately be useful in developing new demographically tailored health care policies or health care interventions. These policies would help overcome the barriers to offer multiple avenues for diabetes education and decrease the risk of developing complications of diabetes.

Research Questions and Hypotheses

This study was guided with the following quantitative research questions and hypotheses:

Research Question 1 (RQ1): Is there an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes?

Null Hypothesis ($H_0$1): There is no association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Alternative Hypothesis (H_a1): There is an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Research Question 2 (RQ2): Is there an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes?

Null Hypothesis ($H_0$2): There is no association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Alternative Hypothesis (H_a2): There is an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Research Question (RQ3): Is there an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes?

Null Hypothesis ($H_0$3): There is no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Alternative Hypothesis (H_a3): There is an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Research Question (RQ4): Is there an association between type of diabetes education and self-perception health status among individuals with diabetes?

Null Hypothesis ($H_0$4): There is no association between type of diabetes education and self-perception health status among individuals with diabetes.

Alternative Hypothesis (H_a4): There is an association between type of diabetes education and self-perception health status among individuals with diabetes.

Theoretical Foundation

The social learning/cognitive theory (SCT) was used to guide this study. Other theories, notably health belief model (HBM), could help explain how individuals change their behavior after they received diabetes education, and how that education will affect the individuals’ QoL and decrease chronic limitations due to diabetes and self-care behaviors. However, SCT was used to examine more precisely how and when the diabetes communication interaction affects the patient in terms of the importance of diabetes self-management, which could improve their health outcomes and decrease chronic limitations. Researchers described SCT as active living and could be interpreted as a person having to perform routines to get the desired behavior (Skinner et al., 2008). This behavior is affected by three variables: “the person, the person’s behavior, and the environment” (Skinner et al., 2008, p. 1117). A person’s expectations can help mold his or her behavior. There are three expectations that influence the outcome of a behavior: consequence of one’s actions, competence to perform the behavior in order to influence the outcome, and reinforcement or incentive. Yet, only the individual can interpret how these factors would influence his or her own behavior.

In this study, the I focused into the different processes in delivering diabetes education. SCT has been known to focus on individuals’ perceptions of their ability to enact behaviors and follow through on action plans (Skinner et al., 2008). This is also known as self-efficacy, which is similar to self-confidence. “Self-efficacy has been shown to be one of the most consistent predictors of successful self-care behavior and has been incorporated into most health psychology models” (Skinner et al., 2008, p. 1117). Diabetes education sessions usually address *SMART GOALS*: Specific, Measurable, Action goals that are Realistic and Time-limited. These goals help individuals to identify barriers to achieving their goals and use structured problem solving to help them overcome these potential barriers.

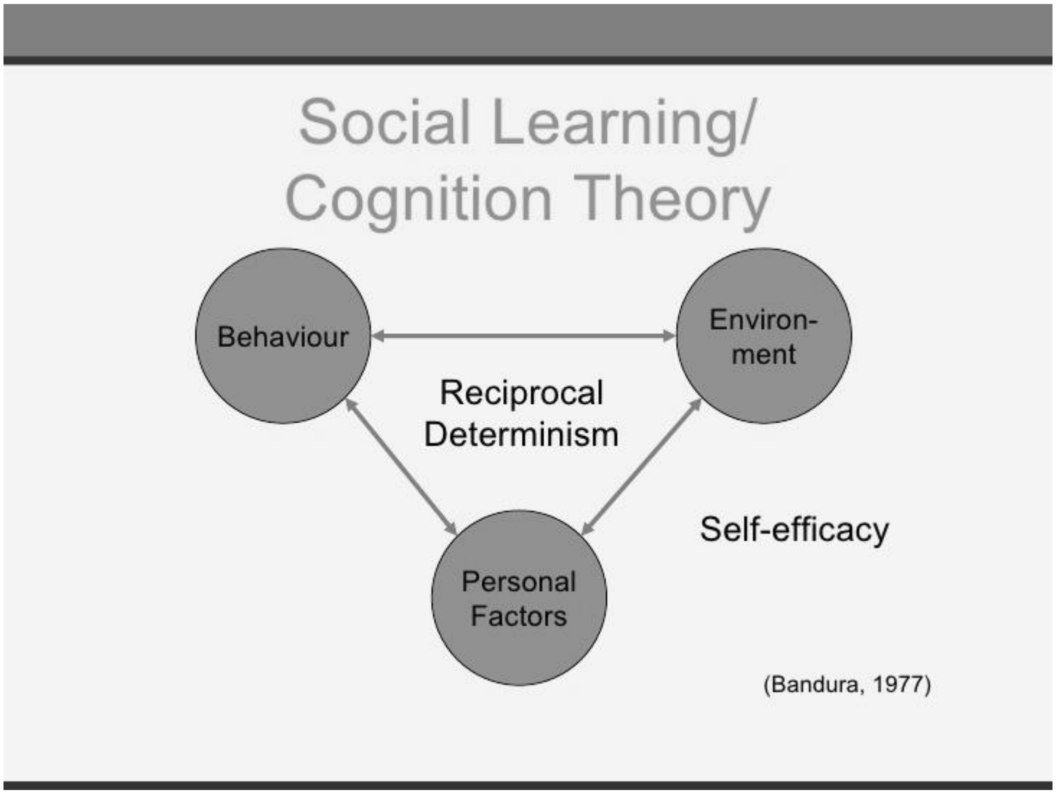

Figure 1. Theoretical propositions of the social learning cognition theory.

Health belief model (HBM) was also be an auxiliary theory to this study because it addressed how different variables will influence how a person’s beliefs will be involved in his or her health behaviors. Within this theory, *value expectancy* describes the expectations of future value or potential outcomes after considering the perceived benefits and costs of taking certain actions in relation to health and well-being (Rosenstock, 1974; Skinner et al., 2008). HBM was founded on four constructs: personal susceptibility, perceived severity of the condition, perceived benefit of taking a particular action against the threat, and perceived barrier(s) to taking action. This theory helped identify the barriers individuals faced in order to help achieve the pinnacle of self-diabetes management. These barriers included the misunderstanding that self-care might be a way to delay the progression of diabetes.

The HBM was implemented to help explain these results of the study, including how the different types of diabetes communication influences patients’ behaviors. During this study, it will be important to understand the individual’s culture, barriers to diabetes communication, and the patient’s individual barriers in optimizing the opportunities for each participant to reach the fullest potential in perfecting his or her health.

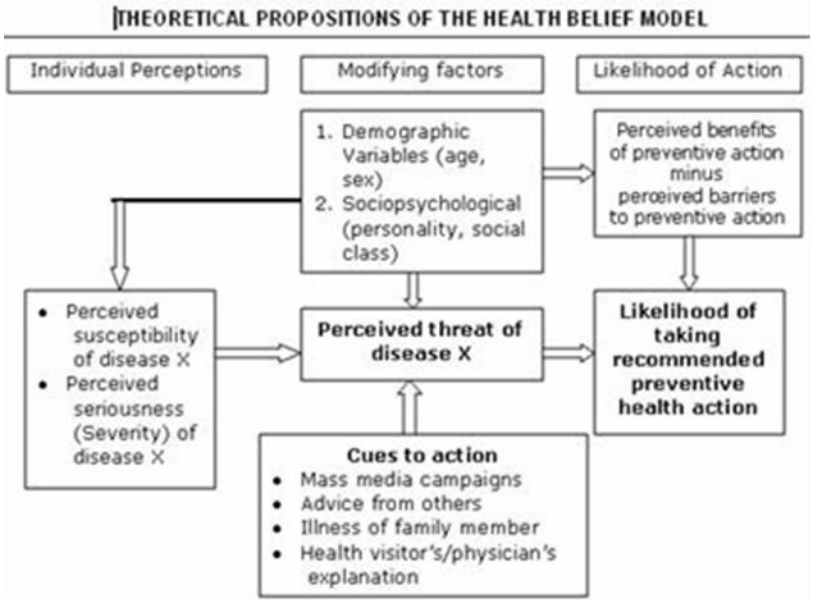

Figure 2. Theoretical propositions of the health belief model.

Nature of the Study

This quantitative study was a cross-sectional design derived from secondary data from the NHIS. Internet-based and alternative forms of communication influence people’s lives today because they spend time gathering information online, using social media (e.g., Facebook), phone calls, or email (Yu et al., 2012). This study considered the application of this concept by asking this question: Does the type of diabetes education communication (FTF versus FTF with alternate forms of communication) have an impact on participants’ chronic limitations, satisfaction with healthcare for non-insulin dependent and insulin dependent, or self-perceived health status?

Traditional diabetes education involves the individual going to a Certified Diabetes Educator (CDE) and/or an HCP to be instructed on diabetes management. This type of education will be referred to as FTF education in this study. Researchers reported that FTF with a CDE produced positive effects on knowledge, self-reported dietary habits, QoL, and glycemic control (Yu et al., 2012). This study will involve the use of secondary data from the NHIS to determine how FTF diabetes communication or FTF with alternative forms of education (texts, chat rooms, and emails) diabetes communication (not telehealth) impacted chronic limitations, self-perception of health status, and satisfaction with healthcare (non-insulin dependent) and insulin dependent participants.

This study focused on addressing the different communication avenues that participants with diabetes might have with their HCPs, evaluating FTF communication versus FTF with alternative forms of diabetes educational communication, such as email, chat rooms, Internet, or phone calls. To do so, patients’ chronic limitations due to diabetes, satisfaction with healthcare for non-insulin dependent and insulin dependent, and self-perception of health status was reviewed. This study focused on examining participants with diabetes who seek additional information about their disease management outside of traditional FTF interactions with an HCP to determine whether additional methods of obtaining information will be associated with chronic limitations, self-perception health status, and satisfaction with healthcare for non-insulin dependent and insulin dependent participants. In addition, the focus of this study was to explore how demographics, such as age, sex, education level, and ethnic background, will influence the observed relationship among the variables. Understanding the relationship between chronic limitations, self-perception health status, and satisfaction with healthcare among diabetes participants and the delivery of educational communication and exploring how demographics impacted the relationship. The relationship may facilitate a discussion to change policies on the multiple legitimate education communication avenues. In addition, patient characteristics could be used to tailor the method of diabetes communication.

SPSS version 24 was used for the statistical analysis of the data. Univariate descriptions of each variable, including measures of central tendency and variation, provided an understanding of the composition of the sample investigated. Measurements of the multivariate relationships between each independent variable (FTF and FTF with alternative forms communications) and dependent variable (diabetes participants' satisfaction with healthcare, self-perception of health status, and chronic limitations factors) was conducted to show how these variables were associated with each other. Demographic groups (age, race/ethnicity background, sex, and educational level) were explored for a relationship among the two educational groups.

Definitions

Alternative forms of communications (education): For this study, these forms of communications included phone calls, emails, chat rooms, and exploring the Internet for health information.

Certified Diabetes Educator: Certified diabetes educator is a healthcare professional who focuses on providing education for patients who have been diagnosed with Diabetes Mellitus (Type 1 and Type 2) and related conditions to achieve better blood sugar control (AADE, 2011).

Chat room: Chat room involves a group of individuals with similar or common health related interests and predominately non-professional backgrounds that interact and communicate over the Internet to build a distance relationship (Demiris, 2006).

Diabetes Self-Management Education (DSME): DSME is a “collaborative process through which people with or at risk for T2DM gain knowledge and skills needed to modify behavior and successfully self-manage the disease and its related conditions” (AADE, 2011, p.24).

Face-to-Face (FTF): For this study, FTF was a regular scheduled meeting with a HCP to discuss their disease, such as diabetes mellitus (Paraskevi, 2013).

Health Care Provider (HCP): HCP refers to a medical professional who is licensed to provide treatment advice for a patient who has diabetes mellitus (Paraskevi, 2013).

Health related quality of life: Health related quality of life is quantified as one’s overall satisfaction with life or a sense of personal psychological, physical, and social well-being in one being self-determining, satisfied, and independent of control from disease processes (Paraskevi, 2013).

Health status: Health status refers to the self-reported description of the participant’s health (Paraskevi, 2013).

Oral medication: Oral medication refers to medication prescribed by a physician for decreasing elevated blood sugars for a participant who is diagnosed with diabetes mellitus (Paraskevi, 2013).

Quality of life (operational): Quality of life (operational) consists of a combination of the measure of satisfaction of with diabetes control and measure of self-care behaviors (Paraskevi, 2013).

Type 2 Diabetes Mellitus (T2DM): T2DM is a metabolic disorder featuring high blood sugar levels, insulin resistance, and insulin deficiency. The most prominent symptoms include excessive thirst, hunger, and urination. Diabetes is usually treated with pills, but patients may also require supplemental insulin (AADE, 2008).

Assumptions

Certain assumptions were made in this study because it involved secondary data from the 2016 NHIS. The National Center for Health Statistics (NCHS) set the regulations that the NHIS followed while collecting the data. The participants were randomly selected according to NHIS, and they were informed of the importance of their participation, as well as that confidentiality would be maintained. The selected individuals were given the option of not participating if they chose to decline (CDC, 2011). The information collected had to remain credible in order to be utilized for the study. In order to build on the NHIS for the present study, the following assumptions were made:

- The participants answered the questions truthfully.
- The NHIS preserved participants’ rights.

- Data collection was completed according to the Public Health Service Act of 2010.
- The participants understood the instructions for the survey and answered the questions according to the instructions given. For example, if they were asked if they were diagnosed with T2DM they understood the meaning of that definition.
- The data presented in the NHIS was obtained from participants that had freely agreed to be part of the study.

Scope and Delimitations

This study used 2016 NHIS data to examine the associations between the type of communication with the HCP among diabetes participants and the chronic limitations, self-perception health status, healthcare satisfaction for non-insulin dependent and insulin dependent diabetes participants. The participants in the original study were randomly selected and agreed to answer the questions within the NHIS. These questions were presented to each participant in a survey form, and participants could decline to answer any of the questions. The data collected was kept confidential, and the participants were told how their data would remain private.

The individuals in 2016 NHIS study and my study was between the ages of 18 and 80 years, have diverse ethnic backgrounds, and were all be living in the United States. The 2016 NHIS quantitative study had a large sample size of over 500, which represents the general population in order to generalize the results (Creswell, 2013). The variables in this research study reflected diabetes participants to include chronic limitations due to diabetes, (in some analyses) the categorization of satisfaction with healthcare for non-insulin dependent and insulin dependent participants, and self-perception of health status. The individual with diabetes were the main variable (the participants will be filtered out of the 2016 year as self-reported diabetes), while the type of communication (education; FTF with alternative versus FTF) that influenced the QoL, and the numerous barriers to care, such as age, sex, educational level, and race/ethnic background, were the other variables. It will be important to mention that the NHIS database represented the general noninstitutionalized United States population (CDC, 2015d).

The delimitations of the study included that there were no direct observation of the participants and no direct manipulation of different forms of communication. The secondary data was categorized by the different forms of communications. One group was the FTF and the other group was the FTF with supported alternate forms of communication such as text, chat, and website information. All survey responses were self-reported by the participants.

Limitations

When using secondary data, there are a few limitations considered. The first limitation is that all the data will be secondary. The usage of secondary data might pose a problem with time validity since the data were collected in the past. Time validity might be best described as time passes from the date the data were collected. The results thus might not hold for time periods before or after 2016. The present study’s results could still provide valuable insight for future research.

The most current data available was used for this study. The 2016 NHIS data were also collected on a self-reported basis and could be subject to recall bias (CDC, 2016d). Thus, these answers might not be honest responses for all participants (CDC, 2016d). However, "studies done using NHIS have been found to be strong indicators of health and disease even with the limitation of recall bias and participants' reluctance to be forthcoming regarding diabetes" (Parsons et al., 2014, p. 20).

Another limitation that has been identified is that the study used data that consisted of records from households and individuals that came from public use files of NHIS. Public use files are referred to as a data set that may be accessed by filing out an application for research. The data were delivered about each individual, dependent variable question that reflected my research question. Additionally, even though the sample size for 2016 year was approximately 112,053 people, 60,134 households, and ranked one of the largest surveys conducted annually by the U.S. government, the samples might not provide enough cases for the subpopulations for a reliable study. Although this was large sample size, the data was filtered to only participants who have diabetes. If the sample became the same as the population, the number of participants with diabetes should be around 9%, which was around 10,084 participants. Due to self-reporting, this number might be significantly lower. Another limitation may be that this study was based on observation. Thus, the researcher utilizing the data should make no effort to recover an individual's identity from the data. The final limitation would be that the geographical area was identified for the surveys. Thus, these data was limited to these geographical areas in that year.

In reference to the diabetes diagnoses, 1 in 4 people do not know they have diabetes because they have not been diagnosed. Thus, the NHIS survey may underestimate the number of people who have diabetes (CDC, 2015d). Additionally, the variables of chronic limitations due to diabetes, satisfaction with healthcare while on insulin or diabetes pills, and self-reported health status might not be measured through direct questions but implied through a combination of multiple answers. For example, to gauge respondents' satisfaction of health care while on insulin or diabetes pills, three separate questions were relevant: "Are you on diabetes oral medication?"; "Are you on insulin?"; and "How would you rate your current satisfaction with your health care?" (Centers for Disease Control and Prevention, 2016). Every one of these questions was a part of my research question. The chronic limitations due to diabetes and self-perception health status were a direct question to answering my research questions.

Significance of the Study

This study might contribute a revolutionary rethinking of how HCPs communicated with their patients who were diagnosed with diabetes, and in turn increase the patients' QoL and decrease chronic limitation due to diabetes. HCPs must understand the numerous barriers to receiving quality information about diabetes because of the costs of visits, time, and transportation to and from visits. Alternative forms of communication, such as the web, quality phone communications, chat rooms, or even email messages with individuals with diabetes, might be the additional tool needed to help decrease the barriers to education. These barriers must be addressed to have a better understanding of diabetes management.

Significance in Practice

Satisfaction with healthcare or patient satisfaction while one has T2DM may shift during their progression of different oral medications, injectable, and insulins. The patient satisfaction may change because they may develop complications of diabetes (kidney failure, blindness, neuropathy, and heart disease (ADA, 2016). The satisfaction with healthcare may be directed to their physician and not the whole experience (Fenton, Jerant, Bertakis, & Franks, 2012). The National Study of Patient Satisfaction showed that the geriatric population patient satisfaction had no association with the technical quality of geriatric care (Fenton et al., 2012). The Health Plan Employer Data and information Set of Quality Metrics showed no correlation with or had little to do with technological quality (Fenton et al., 2012). Even though these researchers have studied the geriatric population, this study considered demographics, such as age, race, gender, and education, to further expand the healthcare experience and determine if it might change a participant's perception of their satisfaction with healthcare with alternative forms of communication with HCP. The outcome of this study could steer the HCP to providing more alternative forms of communication (education).

Diabetes medications, Glucogon-Like- Peptide-1 (GLP-1) injectable, and insulin have to be administered correctly. Education must be made a high priority for diabetes patients who begin on these treatment plans. The accurate and timely education increases healthcare satisfaction for the patient and the HCP. The individual must understand the reasons for the progression to the next level of treatment. The participant must see results in the blood sugars and their health status for them to continue the treatment options.

Thus, the education must be timely, consistent, and valuable to the participant (ADA, 2016). The HCP needs to have quality time with the participant to explain the situation with the treatment options. When the HCP assumes the patient understands the process, but the patient really does not, it may lead to the participant looking for information from websites, phone calls, chat rooms, and emails. External information may improve their satisfaction with their healthcare and health status, but the information may also frustrate participates.

The information the individual receives about their disease management and the progression may be the key to their self-perception of health status and the satisfaction with healthcare. The disease progression of a T2DM means their blood sugars may not be controlled with one treatment after a duration of time. The A1C elevation was the indicator to the HCP to change the treatment options for the T2DM. The changing in the treatment options might follow the ADA (2016) algorithm for the oral medications, which eventually progressed to GLP-1 and/or into multiple different types of insulins.

When a patient has frequent interactions with a physician, they may be more satisfied with healthcare because they perceive that they are receiving attentive care for their issue. Fenton et al. (2012) also mentioned it was imperative to spend more time with a patient for higher patient satisfaction rates. The patient satisfaction rates were not based on alternative forms of communication (chat rooms, emails, or phone calls), in addition to the physician visits.

Fenton et al. (2012) covered all chronic disease states; my study will cover only the participants who were diagnosed with diabetes. Patients with diabetes have particular self-care behaviors that have to be performed each day. My study may benefit the HCP and the patient in providing a tailored diabetes education if the study reveals demographic characteristic and the participant's preference to additional education provided via technology.

Significance of Education With Theory

This research provided additional information in determining the differences between two types of diabetes communication (education; FTF verses alternative forms of communication) in diabetic participants' satisfaction with healthcare, self-perception health status, and chronic limitations. The study's results compare SLT theory, which could help HCPs understand whether alternative forms of diabetes communication made up for the lack of accessibility to free quality diabetes education when compared to FTF communication, and if it will impact the QoL of individuals who have diabetes. Currently, HCPs know that diabetes education makes a positive impact on health outcomes; however, few studies have analyzed differences in health outcomes based on the type of diabetes education intervention or communication (Cusack et al., 2008; International Diabetes Federation, 2011; Yu et al., 2012).

New forms of patient education have evolved in diabetes education, including webinars, online training, chat rooms, phone calls, emails, and social media, rather than relying on the FTF classroom set-up or one-on-one sessions. Telehealth has also been increasingly utilized, but patients must pay to use the service in most cases. Based on this knowledge, this study compared alternative forms of diabetes education and communication, such as Internet-based diabetes communication and information exchange to FTF diabetes education and communication with an HCP thereby excluding telehealth.

Free online diabetes education is becoming a more popular option because of its lower cost, greater convenience for the participant, and privacy (Hunt, 2015). Due to the increase in access and reduced costs of alternative forms of education, it was important to determine if there were differences associated with one form compared to the other. This study evaluated the potential these methods of diabetes education and communication compared to theory to see whether Internet-based and alternative forms of diabetes communication made a significant difference in the three variables of chronic limitations, self-perception health status, and satisfaction with healthcare for non-insulin dependent and insulin dependent participants while exploring the relationship with demographics.

Significance to Social Change

An HCP influences the opinions of their patients, their employees, and their fellow members of committees and associations. Overall, a physician influences the community that he or she serves. The impact includes how the members of the community perceive beliefs about their health, and about how and why to get additional information or education about a disease, such as diabetes, heart disease, or cancer (AADE, 2016). Currently, physicians and/or other HCPs may not be open to their patients receiving information or education from social media, including the web, Twitter, blogs, and so on. The majority of clinicians are not ready to endorse the information from these sources because these news sources may represent inaccurate health sources (Maine Center for Disease Control and Prevention and Maine Department of Health and Human Services, 2006).

These clinicians commonly cite several reasons for not recommending alternate forms of communication: Individuals receive *bad* information; patients transmit *bad* information; physicians receive information badly; and physicians transmit information badly. One would define bad information as incorrect information based on little evidence (Cusack et al., 2008). If a physician recommends diabetes education from more than one avenue (FTF versus FTF with alternative forms), the individual might have more opportunities to receive the right information to manage his or her diabetes. Thus, diversifying these recommendations might help decrease the diabetes epidemic and might create positive social change and social practice.

This study may result in positive social change by identifying the associations between the type of education and the participants' demographic group. Besides understanding the associations with the preferred method of education with a specific demographic group, this study involved the examination of the association with the participant’s health statuses, chronic limitations, and health satisfaction for non-insulin and insulin dependent participants. By identifying the type of education most beneficial for the demographic group, the preference for education guided the HCP to recommend a tailored education program for the person with diabetes, thereby decreasing diabetes related health issues and implementing more alternative educational programs for participants.

Summary and Transition

There is a significant need to educate T2DM individuals on self-management skills, so they could continue to enjoy a high QoL without numerous complications. Most information given to individuals with diabetes is communicated through FTF with their HCPs and/or CDEs. Unfortunately, the patients are receiving little detailed information from the professional's due to several barriers: time constraints, insurance coverage, transportation, lack of referrals to education programs, and lack of convenience. This study explored whether there is a better way to provide and/or communicate accurate and reliable information to T2DM individuals.

In recent years, other methods for diabetes education have emerged. More patients use websites, social media, emails, phone calls, and texting to get health information compared to using traditional FTF education sessions. This increased use of other methods of communication showed that there was an increased need for alternative sources of communication, such as web-based programs, to support individuals in developing and encouraging a better skill set to manage their T2DM. More forms of communication from professionals should help reduce barriers to accurate and reliable patient information in a timely manner. When the information is better accessible to participants, QoL increases and healthcare costs decrease.

The next chapter includes the study's primary variables: forms of communication, patient satisfaction with the current method of information flow between diabetes patients and HCPs, chronic limitations, patient satisfaction with healthcare for non-insulin and insulin dependent participants, and self-reported health status with exploring demographics relationships. Chapter 2 also contains several barriers for participants with diabetes to receiving accurate information from their HCP: cost, insurance availability, HCP communication skills, transportation to the HCP, and the participant’s own interior motivation to achieve change through improved support for their diabetes. When individuals have accurate and timely information, the participant can manage their diabetes routinely with fewer complications, thereby decreasing chronic limitations due to diabetes.

Chapter 2: Literature Review

In this study, I explored the relationship between diabetes communication delivery methods, specifically examining FTF communication vs FTF with alternative forms of communication delivery. I tested whether a method was associated with better (or improved) patients' satisfaction with their healthcare for noninsulin-dependent and insulin-dependent patients with diabetes, I also examined associations between communication methods and self-perceived health status, and reports of chronic limitations. Specifically, I compared FTF communication with a HCP to FTF with the support of Internet-based communication forums, email, and telephone education. I explored age, sex, educational level, and race/ethnicity to understand possible associations with the two groups (FTF verses FTF with support Internet-based communication).

According to ADA (2016) standards, it is essential to keep clear communication with new T2DM patients about their recent diagnosis. However, the ADA (2016) standards did not specifically describe how many different avenues of communication the HCP could use to meet this goal. A patient's diabetes management becomes successful when an HCP focuses on patient-centered, individualized, and culturally supportive care (ADA, 2016). Given this outcome, the patient can self-manage his or her diabetes more effectively. A patient's communication with his or her HCP must be timely, reliable, and accurate, and HCPs must be innovative to keep their patients motivated (AADE, 2008; ADA, 2016). If HCPs do not meet these goals, their patients frequently seek health information from other resources. However, HCPs are not limited to communicating

FTF; they can also educate patients via telephone, texts, email, web-based communication, or social media. I determined that there is no relationship between the communication methods. However, the various factors that impact the variables had influenced participants with diabetes.

In the literature review in this chapter, I first address a theoretical social cognitive model that had helped explain the potential relationships among chronic limitations due to diabetes, self-reported health status, satisfaction with healthcare for non-insulin and insulin dependent, and the two forms of communication. The review will illustrate how diabetic patients identify several barriers to decreasing their chronic limitations, improving the satisfaction with healthcare for non-insulin and insulin dependent, self-perception health status, and how the different barriers may impact communication with the HCPs. Several barriers to information may hinder QoL by reducing patients' diabetes self-management skills: cost, access, communication reliability, cultural differences, and satisfaction with the information exchange (Lounsbury, Hirsch, Chawntel, & Schwartz, 2014). In addition to reviewing the association between the two groups, the demographics groups may have an impact for the different barriers presented for each variable.

Self-management is an essential part of managing diabetes, and the more patients engage in their own health, the better their QoL becomes with a decrease in chronic limitations due to diabetes (ADA, 2016). Similarly, the more proactive a patient with diabetes is in applying information gathered from different sources, such as an HCP, Internet, social support, family support, and social media, the better he or she can understand their disease (Lounsbury et al., 2014). For this study, an HCP was defined as a professional who specializes in treating and managing a person's general or specific health needs. Research studies addressed the importance of having FTF education for better self-care management, but these did not review the impact of alternative forms of communications support and FTF with specific demographic groups on chronic limitations, healthcare satisfaction for non-insulin and insulin dependent diabetics, or self-perception health status.

Literature Search Strategy

To conduct this literature review, I used several electronic databases, including EBSCO, ProQuest, Pre-CINHAL, CINHAL, CINHAL Plus, Health Source, PsycINFO, MEDLINE, Google Scholar, and the Walden University Electronic Library Catalog. The key search terms that I used for the review included *communication, Health Care Provider, HCP, diabetes, education, quality of life, virtual, telemedicine, web-based, diabetes management skills, perception, Internet, behavior skills, T2DM, QoL, DSME (Diabetes Self-Management Education),* and *CDE.* The results included studies about diabetes, educational opportunities on the web, and face-to-face interactions with HCPs. The studies were from all over the world, and most of the studies that I reviewed focused on T2DM and were published after 2010.

Theoretical Foundation

The theoretical framework involved the social cognitive theory (SCT), which I used to interpret the results and determine a possible relationship among the relevant variables. The participant’s behaviors identified by the theory helped apply the research results to other forms of medical education, making these more useful to the public. I utilized the SCT to identify the potential reasons why a person might change a behavior due to the type of education encountered. The variables that were analyzed in this project included diagnoses of diabetes, QoL, and demographic factors, such as age, educational level, sex and cultural belief system. The SCT model helped explain the possible outcomes generated by the analysis.

The participant's behaviors analyzed by the SCT argues that human behavior is influenced by one's environment, personal factors, social support, and attributes of behavior and self-efficacy that play certain roles in the interaction process (Shen, Edwards, Courtney, McDowell, & Wu, 2012). This theory was used on patients and clinicians to determine or predict their behavior. If HCPs become aware that their practices may not be producing the best health outcomes for their patients, they may opt to change their current habits in delivering or receiving information. According to Presseau et al. (2014), a patient's self-efficacy is an important variable when assessing a clinician's ability to change that patient's behavior to help the patient overcome significant barriers to following through in self-care. These barriers (e.g., costs, lack of access, and perceptions) can be analyzed using SCT to clarify relationships and potentially predict outcomes.

One of the factors that SCT might address was the patient's perception of his or her interactions with the HCP. Because the patient might have to overcome numerous barriers to change a behavior, he or she needed to see the potential for a positive outcome. Often, diabetes patients stated that they were misinformed by a HCP or that they did not understand all the information presented to them about the diabetes self-management process (American Association of Diabetes Educators, 2015). In one example, there was a perception difference between the general practitioner (GP) and the patient regarding the need for insulin initialization. The GP assumed the patient understood the reason for the insulin initialization, but the patient was confused about why he or she had to start the treatment (Cassimatis, Kavanagh, & Smith, 2014). When a patient is confused in this way, he or she may discontinue the follow-through behavior. Thus, the HCP has to recognize potential barriers, including why a patient may not want to take insulin, before successfully treating elevated blood sugar with insulin.

There are numerous barriers to overcome for diabetes self-care, including informational support, social support, the doctor-patient relationship, a psychological support plan/preparedness and morbidity salience, lack of information/understanding, psychological pressures, medication-taking barriers, resistance to insulin initiation, and practical limitations (Cassimatis et al., 2014). These barriers are exaggerated by financial costs (medications, health appointments, and healthy food), limitations on physical activity (weather, no time, fatigue, and eating on the run), motivational issues (lack of progress, sense of defeat, and adherence over time), and psychological issues (stress from work, family, and diabetes; Cassimatis et al., 2014). Patients may cite these reasons to explain a lack of forward progress in their self-management behaviors. However, the SCT can explore the one variable that may turn the patient’s behavior into a positive result.

Clinicians have offered many suggestions to help alleviate some of these barriers, such as having an online program with self-monitoring tools for diet, exercise, blood sugar levels, and A1C levels. A secondary suggestion included setting specific goals, such as reducing the patient's A1C to the ADA (2016) goal of less than 7%. The A1C reflects the average of the blood glucose levels over a 2-to 3-month period (ADA, 2014). Diabetes management skills may have a direct impact on the patient's A1C control. For instance, if the patient has poor eating habits, nonexistent physical activity habits, and does not adhere to diabetes medication, then the A1C may be elevated. Regular interactions or reminders to improve may alleviate some unhealthy behaviors. Self-management is essential, but it may be supported by online apps or websites. In addition to keeping up these good habits, patients' ability to keep appointments with their HCPs, take their medicine, and check their blood sugar may be supported by participating in social support chat rooms or forums (Cassimatis et al., 2014). HCPs and patients must be aware of the barriers to better self-management and be willing to utilize various tools to decrease them. SCT takes the barriers (i.e., the study variables) and shows the relationship between a given barrier and the creation or non-creation of a given behavior.

The purpose of using a website for tracking blood sugars, self-behavior changes, and healthy eating would be to capture information used to influence a behavior change. Many HCPs agree that online activities will support diabetes self-care, but their main concerns are whether the websites have reliable information and whether these will be easily accessible to older patients (Cotterez, Durant, Agne, & Cherrington, 2014). The HCP may be willing to help the patient learn how to access the information, but he or she needs a good understanding of all the resources on the Internet in order to refer patients to these appropriately. This resource may be helpful for patients who do not have convenient access to a HCP. Future research should examine web-based interventions to understand patterns of HCP knowledge and patient engagement, especially in underserved communities (Cotterez et al., 2014).

Several reviews of Internet diabetes programs have been published since 2011. Cotterez et al. (2014) identified over 137 web-based applications; most of them focused on insulin titration; and very few focused-on lifestyle modifications. When investigators reviewed the applications for content and strategies, inclusion of behavior theory and education with tailored feedback were notably lacking. These findings were surprising, given that 95% of individuals with diabetes have T2DM, and only 5.8% of newly diagnosed patients received education from a CDE within the first 12 months (AADE, 2008; American Association of Diabetes Educators, 2013). This disease must be managed by heavily focusing on lifestyle modification, and typically includes oral agents as a first-line therapy (Cotterez et al., 2014).

The AADE (2011) did a pilot study using diabetes self-management education (DSME) and a diabetes self-management support (DSMS) in a web-based intervention called the eDSME. This Web 2.0 program used three constructs: the health belief model, the theory of planned behavior, and social cognitive theory (Brown & Ilich, 2015). These theories were used by the eDSME researchers to explore the process of behavior change when patients interacted with the eDSME program. This study revealed that more interaction with a tool to help monitor proper lifestyle modifications was an absolute necessity for a person with diabetes to have a better QoL (Brown & Ilich, 2015).

My research study was primarily focused on SCT, but the HBT was also an auxiliary theory. I addressed how different variables influenced how a person’s beliefs were involved in his or her health behaviors. The participant’s beliefs identified in the HBM addressed how value expectancy may understand the relationship of the type of education, demographics, and the QoL variables. Value expectancy describes the expectations of future value or potential outcomes, after considering the perceived benefits and costs of taking certain actions in relation to health and well-being (Rosenstock, 1974; Skinner et al., 2008). The main constructs of HBM are founded on personal susceptibility, perceived severity of the condition, perceived benefit of taking a particular action against the threat, and perceived barrier(s) to taking action. A participant might experience numerous barriers for receiving FTF education; hence, this theory would help identify the barriers individuals faced in order to help achieve the pinnacle of self-diabetes management. Misunderstanding the self-care management of diabetes might be just one of the barriers that could be addressed with the HBM.

The participant’s behaviors identified by the SCT construct identifies the different elements that a person goes through to achieve behavior change (Rosenstock, 1974; Skinner et al., 2008). Using alternative forms of communication with T2DM patients might improve their QoL. Professionals need to be open to referring alternative forms of education/ communication to diabetes patients for better health outcomes. I analyzed the data to find out if the participants accessed diabetes information from the Internet, social media sources, phone calls, and texts. This data could reveal a negative relationship, showing that participants were unhappy with their HCPs’ communication levels. The topics that were covered in these communications included the disease process, barriers to managing the disease, the lack of money to support regular health care visits, and medication (Bond, Burr, Wolf, & Feldt, 2010). Producing more accurate and reliable information, along with achievable and affordable access, has become a necessity. SCT might identify how all the different barriers relate to changing self-management skills and QoL, as based on the type of communication the patient had with the HCP.

Diabetes Overview

Diabetes is a growing epidemic, partly because there are shortages of HCPs and increasing healthcare costs. These factors are complicated by multiple medications, doctor visits, and education sessions (American Association Diabetes Educators, 2013). These create a demand for more accurate information and more patient communication to help patients self-manage their diabetes for better QoL. Even though diabetes is on the rise, physicians and educators are not utilizing every possible tool to educate their patients about self-management because there is not enough evidence-based research to facilitate protocols that support alternative forms of diabetes patient education (Cusack et al., 2008). Physicians advocate for early intensive management of T2DM in order to maintain glycemia and glycated hemoglobin (A1C) at the lowest possible levels and to start early aggressive management of all known risk factors, mainly through FTF communication (Cusack et al., 2008). The researcher reviewed and addressed these areas and the need for more research.

Diabetes Prevalence

According to the CDC (2015b), in the United States, about 29.1 million people had diabetes (9.3% of the population), of whom 8.1 million people (27.8% of cases) were still undiagnosed. Thus, the total number of individuals diagnosed with diabetes is about 21 million. As of 2012, the number of diagnoses exhibited the following racial/ethnic breakdown among U.S. adults aged 20 or older: American Indian or Alaskan 15.9%, Non-Hispanic Blacks 13.2%, Hispanics 12.8%, Asian Americans 9.0%, and Non-Hispanics Whites 7.4% (CDC, 2014a). Roughly equal numbers of males and females have been diagnosed. Due to the prevalence of diabetes in the United States, it would be ideal for HCPs to take advantage of every tool available to them to manage their patients' QoL. According to the CDC (2014b, 2015c), the best way to manage diabetes is to see an HCP, eat healthy, and stay active. This research project focused on the many forms of communications that the HCP might have with diabetes patients, and how this relationship between the HCP and patient might impact health outcomes.

The Economic Impact of Diabetes

In 2011, the total costs of diabetes reached $174 billion in the United States, which included $116 billion in direct medical costs and an additional $58 billion in indirect costs (e.g., disability, work loss, premature mortality). Medical expenses for people with diabetes are more than two times higher compared to those for people without diabetes (CDC, 2014a). According to the CDC (2014a), diabetes cost the United States an estimated $245 billion in 2012.The large jump in medical costs were due jump in medical costs. Poor blood sugar control can accelerate multiple other health issues among T2DM patients, and T2DM may be accelerated by other health conditions such as Alzheimer’s disease (AD) or other dementias.

This combination created additional costs. For a T2DM Alzheimer’s Medicare patient (age 65 or older), the average annual per-person payment was $24,776 in 2009, compared to $13,395 for AD patients without T2DM (Camp, Fox, Skrajner, Antenucci, & Haberman, 2015). Of the American individuals who lived with some form of dementia and diabetes in the year 2014, about 5.2 million had AD. In addition, 60% to 70% of them lived in the residential community; 75% lived with someone else; and 25% lived alone (Camp et al., 2015). The elevated cost might contribute to decreased budgets for the proper supplies for diabetes management and a decrease in blood sugar control. In turn, these factors might increase chronic limitations due to diabetes, including the ability to live in a residential community instead of an institution.

Chronic Limitations Among People With Diabetes

Participates diagnosed with diabetes has a negative impact on QoL when the patient’s diabetes self-management skills are not satisfactory. The disease may lead to increased mortality rates and increased economic costs (ADA, 2014). An individual may define QoL several ways. One way would be to demonstrate the activities of daily living without difficulty. Physical activity without difficulty may also contribute to better QoL.

In 2013, there was a 38% increase in diabetes-related deaths in North America for those under 60 (Hirsch, 2014). Approximately 33% of people with diabetes also have depression, which may impact QoL and impair daily functioning. Depression introduces an association with unhealthy eating, decreased adherence to medication, and less physical activity (Camp et al., 2015). The epidemic of diabetes and its relationship with increased chronic limitations has an enormous impact on health outcomes and economic stability in the United States.

Hemoglobin A1C and Chronic Limitations Due to Diabetes

A person’s A1C may decrease his or her QoL if the A1C is greater than 7%, the recommended A1C goal for diabetics over a long period of time. HCPs use the A1C lab value to advise diabetes patients on how they may adjust medications and/or insulin (ADA, 2014). The A1C reflects the average of the blood glucose levels over a 2-to 3-monthperiod (ADA, 2014). The A1C may also be known as the HbA1c and as the amount of glucose attached to hemoglobin (Hgb) in the patient’s red blood cells (National Institutes of Diabetes and Digestive and Kidney Diseases [NGSP], 2015).

Researchers correlated the A1C with microvascular and macrovascular health issues when it was above 7% (blood glucose above 154mg/dl; ADA, 2014). The literature included information on how a person with diabetes managed their A1C levels. One study compared the A1C levels between two groups of participants: one from an Internet-based education and one from the FTF (Gatwood et al., 2015). The results showed no significant difference between the two groups, but diabetes education was proven to have better health outcomes based on the A1C (ADA, 2016). A1C elevation may be a good predictor of the complications that a person will develop diabetes and will have an impact on chronic limitations with diabetes. I will study chronic limitations with diabetes between the FTF and the FTF with alternative forms of communication, such as phone calls, chat rooms, and emails.

A better QoL and a decrease in chronic limitations may always be the standard to advocate for better A1C control (ADA, 2016). One way to get a better A1C is to educate a person with diabetes on the proper self-management skills (ADA, 2016). Diabetes information has to be correct and timely, whether a patient receives education, information about FTF, or information from a reliable Internet source. Nolan et al. (2015) reviewed of 176 cohorts, cluster, and randomized controlled studies. Among those studies, 17 studies compared the results of online-accessed education and information to standard education delivery. The promotion and indication of online education in these 17 studies helped the patients have better self-care, better engagement, and better communication with the clinician (Nolan et al., 2015).

The literature traditionally showed FTF education as the standard, yet new research started to show that different mediums of communication might have a positive impact on QoL, decrease chronic limitations usually based on the A1C (Nolan et al., 2015). However, there are many other ways to determine if a person with diabetes has chronic limitations due to diabetes by asking them very specific questions on their satisfaction. Hence, by utilizing secondary data with large sample size, I analyzed several demographic information that may also influence chronic limitations. I explored whether FTF interaction with an HCP versus FTF alternative forms of communication would decrease chronic limitations in reference to self-perception health status, and satisfaction with health care for non-insulin dependent and insulin dependent diabetics. Even though my study collected an A1C, my study was unique because it compared FTF verses FTF alternative forms of communications with all the variables, as mentioned above, and factored demographics to understand better the relationships between each group.

Poor Disease Management due to Education Barriers

QoL or chronic limitations has always been a challenge for both T2DM and T1DM patients due to the complex management of the disease. If one does not understand how to manage the disease, then one’s QoL may decrease rapidly (ADA, 2014). Management is the key to decreasing chronic limitations due to diabetes. The best way for a person to understand how to manage diabetes is to see a CDE and HCP for education.

There are many barriers that prevent patients from seeing a CDE/HCP: cost because of lack of insurance, no CDE available in the area, timing of the appointment, lack of transportation, and lack of desire to attend group meetings (American Association of Diabetes Educators, 2015). There are numerous stigmas that come with having T2DM, and there has been little change over the years (ADA, 2016). Patients who have less communication with an HCP may experience an increase in poor management of blood sugars because of the decrease in social support, poor decision-making skills, and lack of knowledge (Bond et al., 2010).

Lack of Access to Diabetes Education

An essential ingredient of better patient health outcomes was early education on diabetes management. Yet, there were several barriers that prevent the HCP from placing the referral. Some HCPs specifically cited “feelings of fragmented diabetes care” (Suralert et al., 2011, p. 8). These HCPs were concerned that if they refer their patient to an endocrinologist or CDE, the patient’s treatment plan may not be shared with the primary care physician (Suralert et al., 2011). Another common reason is “frustration and insecurity regarding their role in diabetes care” (Suralert et al., 2011, p. 5); meaning, time constraints may not allow the HCP to keep up on all the medications and treatment pathways for diabetes care. The last cited reason, “the need for time to reassure that the program respects their role and added value to care,” shows HCP perceptions that their additional time with patients may not always be welcomed or appreciated by the patients themselves (Suralert et al., 2011, p. 5). All these participant’s concerns may create significant barriers to quality diabetes education.

Complications of Diabetes Decrease QoL

QoL for people who have diabetes will always be a challenge due to the potential complications that may set in over the course of the disease. A1C levels above 7% are associated with several microvascular and macrovascular complications, such as renal failure, amputations, cardiovascular disease, blindness, and neuropathy (NGSP, 2015). Complications of T2DM may be decreased with more self-management, but first the HCP may have to look at different ways to get the information to the patient promptly by circumventing some of the aforementioned barriers (AADE, 2008). The HCP should find more cost-effective methods to close the gap for the benefit of their patients’ health outcomes. One study demonstrated this suggestion by designing a self-care program with multimedia software support and comparing it to a control group (Abumasoudi, Zare, Farahani, Ghorbani, & Purfarzad, 2015). Abumasoudi et al. (2015) specifically evaluated lectures with multimedia software content about diabetes self-care and how it might impact QoL. The authors found no significant difference in QoL scores between the intervention group (the group using the self-care program with multimedia software support) and the control group (Abumasoudi et al., 2015). The QoL inventory questionnaire was used to measure differences in QoL (Bradley et al., 1999). This questionnaire measured 13 domains of QoL regarding employment, ease of mobility, enjoying food, satisfaction with one's social life, sex life, family life, and future worries about one's health (Bradley et al., 1999). Abumasoudi et al. (2015) did not ask how the specific demographics might impact chronic limitations, self-perception health status, and whether the patient was satisfied with healthcare and while on insulin. Given these results, it might be worth HCPs' efforts to supplement their services with alternative forms of communication, such as multimedia software made for low-literacy audiences.

Barriers to Diabetes Education

Resource Barriers

Participant's reimbursement rates from health insurance were a particular barrier that patients mention to explain why they do not consult with HCPs or CDEs (American Association of Diabetes Educators, 2015). Globally, T2DM has made a significant impact on insurance reimbursement and did have a negative impact on the U.S. economy. A study in China found that even though there was an increase in maximum reimbursement for outpatient visits, there remained an increase in out-of-pocket costs for T2DM patients (Zhang, Wang, Qian, & Ni, 2014). In other studies' researchers looked at the feasibility of alternate ways of developing DSME, such as telephone and secure messaging (Greenwood et al., 2014). Greenwood et al. (2014) stated there were no significant differences in health outcomes (A1C and diabetes complications). Prescribers might not have accomplished significant interaction with a patient and might not have studied 16 participants over a significant period of time. I had a significant sample size and asked how different variables impacted health status among the different groups.

Barriers to Self-Management Skills

Alternative forms of diabetes education, such as telemedicine, telehealth, and web-based platforms, have been assessed in rural areas, and these made a significant impact on behavioral and psychosocial outcomes, as well as patient satisfaction (Siminerio, Ruppert, Huber, & Toledo, 2014). Diabetes self-management support using a diabetes specialist team is challenging in rural areas. In this team approach, more than one type of HCP provides education to the patient; the team typically includes a CDE, registered dietitian, physician, physical therapist, and pharmacist. One community utilized this approach in a program called Telemedicine for Reach, Education, Access, and Treatment (TREAT) by pairing an endocrinologist from an urban environment with a CDE from a rural environment (Siminerio et al., 2014). In fact, there is quite a shortage of HCPs in rural areas. There are only 33 primary care physicians per 100,000 residents, and there are about 5 million rural citizens in the United States (Seshamani, Nostrand, Kennedy, & Cochran, 2014). Due to this shortage, underserved areas may have less access to diabetes education. The participant’s answers in my research data explored if there was an unmet need for non-traditional diabetes education.

The social environment also impacted the participant’s behavior, and it may be offered for different support across customs and cultures. Important social factors included family support and resources in the workplace to facilitate diabetes management. Depending on their cultures, individual patients may have had significantly different values, norms, and perspectives (Jack, Liburd, Tucker, & Cockrell, 2014). Thus, diabetes education must be culturally and linguistically appropriate to serve people with diabetes or those at risk of developing diabetes. Several organizations' websites already provided this service: the ADA (2016), the U.S. Department of Health and Human Services Office of Minority Health, and the National Diabetes Education Program (Jack et al., 2014).

As T2DM patients are typically older than T1DM patients, it would be useful to study if T2DM patients above the age of 50 could adapt to a mobile device to help manage their disease process (Haas et al., 2012). According to Sheibe, Reichelt, and Kirch (2015), out of 32 participants (T2DM) in their study, only15 participants understood apps (47%), and two participants used a diabetes app (6%) for therapy. The reasons that the participants did not use apps were the lack of additional benefits compared to current therapy management; they did not gain any amusement while using the app; and they expressed a lack of compatibility with other devices (Sheibe et al., 2015). Some of the operating tests revealed that the font sizes were too small, and the touchscreens were difficult to operate due to press-sensitive areas. The most important aspect of implementing the app was having a technical support person available to answer questions (Sheibe et al., 2015). The researchers in this study offered TD2M patients alternate diabetes information and a chance for better self-management, but evidently the app development and implementation needed more work.

The lack of health insurance or inadequate insurance coverage may be another barrier to see an HCP or CDE due to the cost of office visits. Although diabetes education from a diabetes educator had the strongest correlation with persistently good glycemic control, not all insurance covered the cost of the education (Yin et al., 2015). Patients may need to decrease visits with an HCP/CDE due to cost. In the absence of physical visits with an HCP/CDE, patients may try to access information about diabetes through other forms of communication. For example, in one study, participates of a free web-intervention diabetes education was proven to make a significant difference in improving QoL, social support, and measures of depression, compared to a control group (Bond et al., 2010). Having no health insurance or poor health insurance is often challenging for people with diabetes. Therefore, alternative ways of providing diabetes education at low cost would be a welcome development. Researchers stated that only 22% of their participants had health insurance (Bond et al., 2010). These participants had the motivation to seek more information about their disease by logging into web-based diabetes applications, and this study did show statistically significant improvements in A1C, total cholesterol, low-density lipoprotein (LDL) cholesterol, and triglyceride levels (Ryan et al., 2013).

Other contributing factors to a lack of a DSME attendance include patients' work schedules and related challenges with childcare and transportation (American Association Diabetes Educators, 2013). Pereira, Johnson, and Vorderstrasse (2015) found that Internet DSME improved patients' eating habits and helped them keep more of their appointments. Only 23% to 66% of the United States receives diabetes education services over the course of the diabetes journey (Pereira et al., 2015). Based on these studies, it was apparent that alternate methods for obtaining information about diabetes needed to take place for a better QoL.

Another barrier that inhibited patients from receiving accurate information about diabetes management was when their main HCPs refer them to external education programs because the HCP lacked the time or knowledge to deliver the appropriate education (American Association Diabetes Educators, 2013). Bootie and Skovlund (2015) mentioned multiple educational and informational resources, and they confirmed that the main form of diabetes education was FTF meetings with an HCP. The authors expressed that all the participants found diabetes education sessions helpful; unfortunately, only about 50% of diabetes patients attended those sessions (Bootie & Skovlund, 2015). Another theme that Bootie and Skovlund addressed was poor access to quality diabetes care. In addition, training and support for HCPs was limited, and Bootie and Skovlund suggested that HCPs needed better communication skills to facilitate better diabetes self-management education. Finally, access to technology is needed to enhance support for patient education, especially for family support (Bootie & Skovlund, 2015). Overall, participant’s barriers, such as cost, lack of transportation, lack of referrals, and poor time management, may indicate the need for more communication between the HCP and patient, no matter what avenue that communication takes.

The identification and development of communication tools have to be effective because Bootie and Skovlund (2015) stated that healthcare provisions outside FTF interactions were impactful. Paddison et al. (2015) addressed a similar question: Should nurses be aware of prediabetes and should they educate patients about it? When a nurse must perform an impromptu education session, often it is inadequate and may need to be supplemented with more reliable resources. Paddison et al. stated that 61.2% of nurses educated patients for less than 5 minutes. This brief impromptu education may be the only education the patient receives due to numerous barriers to receiving more formal education.

Another study found a great need for better communication with patients who have diabetes and comorbidities with long-term conditions, and a similar need for better access to appointments (Weymann, Dirmaier, Wolff, Kristen, & Harter, 2015). To manage patients better, health care systems should develop better data management systems to help share care plans among a multidisciplinary team (Bootie & Skovlund, 2015). Participants with diabetes may have unmet healthcare needs, and they often need personalized care plans to gain a sense of control of their disease (Kline & Huff, 2008; Yu et al., 2014). The lack of access to reliable and timely education, physician referrals, and lack of sharing patient information among health care providers may influence the need for alternative forms of communication and education. I helped identify whether there was a relationship between using alternate forms of communication with diabetes patients and their chronic limitations, self-perception health status, and satisfaction with healthcare for non-insulin and insulin dependent diabetics. Demographics was also used to show a relationship of influence on each variable between the two groups.

Internet-based DSME was a great way to minimize these barriers. According to the U.S. Census Bureau, in 2010, even respondents in the 45 to 64 age group had accessed the Internet at least once in the past week (Pereira et al., 2015). The cost of diabetes complications may outweigh the cost of education and support from a healthcare professional. Researchers did analyze the cost of the education for the diabetes patient. The researchers used a simulator model that could predict the health outcomes of diabetes patients and the cost of support for diabetes education over 20 years (Prezio, Pagan, Shuval, & Culica, 2014). They explained that there were a large number of uninsured diabetes patients, especially Mexican-Americans, who needed diabetes education. Back in 2003, these authors developed the Community Diabetes Education (CoDE) program to aid in improving health outcomes and the quality of diabetes care for the uninsured (Prezio et al., 2014). The cost of this program was $435 per CoDE participant in the first year, then $316 per participant after the first year. Over 20 years the cost would be $4958 ($0.68 per day) with a discounted 3% rate (Prezio et al., 2014). This has been done using the Archimedes Model. This model assesses human physiology on disease progression by addressing risk factors and intervention, by using health care utilization to predict possible physiology health outcomes of diabetes that may develop over time, such as a foot ulcer (Pereira et al., 2015). The future of information flow to the patient has to be innovative and timely, and it must help the patient understand the need to self-manage his or her health to decrease complications and allow a better QoL.

Communication With HCPs

FTF Communication With HCPs

Education from an HCP has been traditionally a FTF experience, which means the patient has to go to a physician’s office, hospital, or diabetes center to receive the education (ADA, 2016). Traditional diabetes education occurs when a CDE/HCP instructs a patient on diabetes self-management. An alternate way to provide education would be with, phone calls, emails, or online via a website (Brown & Ilich, 2015). FTF interactions with a CDE have been reported to produce positive effects on knowledge, self-reported dietary habits, QoL, and glycemic control (ADA, 2016; Yu et al., 2012). However, diabetes patients want more diabetes information on demand.

Certified Diabetes Educators (CDE)

The standard for diabetes education would be to refer the patient to a CDE (American Association of Diabetes Educators, 2015). A CDE may be a pharmacist, registered dietitian, or registered nurse. The CDE credential requires performing a minimum number of training hours with diabetes patients, passing a national certification test, and remaining current with 75 continuing education credits every 5 years (American Association of Diabetes Educators, 2015).

There was limited literature that addressed alternative avenues of discovering credible diabetes education online. I helped fill the need for more research on how alternative forms of diabetes education might combat the barriers of receiving FTF education. Many articles showed how conventional diabetes education sessions impacted QoL for diabetes patients (ADA, 2016) and explained why HCPs did not refer patients even though a referral to a CDE would be ideal for patient education. For instance, some HCPs did not refer patients if the patient’s insurance did not cover the cost of the education (American Association Diabetes Educators, 2013) or if other barriers existed to the patient attending the class (Haas et al., 2012; Williamson et al., 2013).

Lifestyle Management Skills With Traditional HCP Communication

A T2DM patient’s biggest challenge is being seen by an HCP FTF without a long waiting time. Thus, the patient’s diabetes management skills may be compromised. For instance, hypoglycemia may result, and the patient must have the skills to take care of it immediately or risk a negative outcome (ADA, 2016). Since there is a decreased number of HCPs to treat and educate patients with diabetes, a diabetes patient needs to master numerous lifestyle management skills, including how to manage hypoglycemia reactions. The patient may lack an understanding of the signs and symptoms of a reaction (shaking, sweating, and dizziness), and how to respond to it when it does happen (ADA, 2016). Hypoglycemia reactions in particular have the tendency to decrease QoL for patients with T2DM, so understanding these must be a high priority for these patients (Lopez, Annunziate, Bailey, Rupnow, & Morisky, 2014).

Likewise, it is essential for blood sugar control to execute physical activity daily, which is one of the central self-management behaviors. Patients should plan the timing, frequency, and duration of such activity to help manage their blood sugar levels (ADA, 2016). Increasing physical activity has been shown to improve QoL by reducing or delaying the onset of physiological complications, such as reduced life expectancy, microvascular damage, and microvascular complications (Jennings, Vandelanotte, Caperchione, & Mummery, 2014). Management of physical activity needs to be understood, in conjunction with tracking carbohydrates and meal planning, to decrease the risks of hypoglycemia and ensure proper blood sugar management. HCPs can recommend individualized physical activity plans to match each patient's current health care plan.

Finally, healthy eating is vital for T2DM patients to understand and manage to help keep their blood sugars under tight control. An individual dietary plan may be helpful in meeting multiple nutritional needs at the same time, such as restrictions on sodium, fat, cholesterol, and targets for protein or potassium (for patients with renal issues; ADA, 2016). The majority of Americans lack knowledge on how to prepare healthy meals due to time constraints or lack of prior education at home or in school (Monsivais, Aggarwal, & Drewnowski, 2014). One of the ways to gauge if a patient has quality food is to see if the patient spends enough time on food preparation. If a patient does spend much time on food preparation, there is a good chance the patient may be spending money on more convenient but less nutritious food (Monsivais et al., 2014). Food preparation has significantly declined since 1960; Americans now only spend about 33 minutes per day on food preparation and clean up (Monsivais et al., 2014). There is a great advantage to seeing a registered dietitian CDE to get an individualized plan, yet most T2DM patients do not know how to eat healthier. These poor eating habits may have contributed to the development of T2DM. I helped show a relationship between the how the different communication groups, identified through demographics, might influence chronic limitations, self-perception of health status, and health care satisfaction for non-insulin and insulin dependent diabetics in the two groups.

Patient Satisfaction With Health Status and Healthcare: FTF Communication

A patient’s satisfaction with his or her health status and healthcare required support from his or her HCP (Harrison, Stadler, Ismail, Amiel, & Herrmann-Werner, 2014). HCPs have stated that diabetes healthcare is inadequate across the entire globe, according to the DAWN 2 study (Funnell, Bootle, & Stuckey, 2015). This inadequacy might be partly because formal diabetes training was included in only one-third of HCPs’ training (Funnell et al., 2015). If an HCP has little training on diabetes, then his or her skills to treat the disease may be substandard, which may lead to inadequate treatment. In reference to poor blood sugar control, the patient’s QoL may also decrease. According to Funnell et al. (2015), 44% of patients with diabetes described their QoL as poor or very poor. The researchers characterized diabetes healthcare in the United States as inadequate, and they suggested that there needed to be better communication, resources, and information exchange between HCPs and patients (Funnell et al., 2015).

Diabetes Self-Management Education (DSME) is usually provided by an HCP but may also be supported by community resources or personnel within an HCP office (Powers et al., 2015). The National Standards for Diabetes Self-Management Education are designed to define quality DSME and support to assist diabetes educators in providing evidence-based education and self-management support. These standards are applicable to educators in solo practice, as well as those in multicenter programs, and everyone in between (Haas et al., 2012). The DSME programs are defined by assessing the current knowledge, health beliefs, family support, physical limitations, financial support, health literacy, and many other factors that may influence a person’s ability to take care of self-management challenges on a day-to-day basis (Powers et al., 2015). According to Powers et al. (2015), DSME has been proven to decrease A1C by as much as 1% with people with T2DM, and they obtained a better QoL. Access to DSME alternatives is appearing in more convenient settings, such as pharmacies, community health centers, and technology-based programs (Powers et al., 2015). Although there are huge benefits to DSME, only 6.8% of patients with private health insurance participate within the first 12 months after diagnosis, and only 4% of Medicare patients received DSME and Medical Nutrition Therapy (MNT; Powers et al., 2015). There are numerous barriers for patients not receiving DSME: health system, the individual care provider, community resources, and the individual with diabetes (Powers et al., 2015). The DSME programs have to decrease these barriers by sharing data to coordinate care and build workforce capacity. Healthcare systems have embraced shifting care to a primary care setting, using technology, and quality measures.

Education and communication certainly need to improve between patients and HCP. More education is needed on the use of insulin, including the reason for its use and how to store it properly (Williamson et al., 2014). HCPs may give the patient more support for diabetes management by advocating additional resources patients can utilize to educate themselves further on self-management skills. These additional resources will supplement some of the HCPs’ lack of knowledge about diabetes management (e.g., prescribing medication, carbohydrate counting, and social support). Some HCPs are not comfortable prescribing medication for T2DM according to the guidelines used for diabetes management. There are significant gaps in perception, knowledge, and management practices among the HCPs (Williamson et al., 2014). When patients have misconceptions about their medication regimens, their blood sugar control suffers because they need more information or support to combat doubts about their diabetes healthcare plans.

Diabetes Self-Management Education

Internet-Based Diabetes Education

There are some studies on Internet-based diabetes self-management education (Pereira et al., 2015) but few on free Internet sites offering diabetes resources, communication, and webinars. There are numerous benefits for diabetes patients who can access and use information at their leisure (Pereira et al., 2015). Welch et al. (2015) compared two platforms for diabetes management, focusing on urban Latino populations. The group using Internet-based platforms had lower A1C levels compared to the traditional diabetes care group, and they had lower diabetes distress and lower social distress at follow-up (Welch et al., 2015). Internet-based education may produce positive outcomes for blood sugar control, but there also needs to be more detailed data on other health outcomes to help determine how physicians can best implement Internet-based education into their treatment plans. I helped fill this gap by identifying the many different communication avenues that a patient might have access to and tracking how many times participants accessed alternative avenues to retrieve more information about their diabetes.

Information resources, such as Internet-based websites and social media platforms, may assist in decreasing patients’ fear of the unknown and isolation, and it may help them better cope with the fears. It is imperative that healthcare providers embrace the changing landscape of patient engagement (Greenwood, 2015). In one study, when using an Internet platform to upload blood sugar data to the physician, patients' A1C levels decreased significantly (Tildesley et al., 2014). An Internet-based platform or even social media may be a resource for patients to retrieve information and help keep their self-management skills sharp to keep blood sugars in better control. The delivery of education via the Internet will advance because this education medium is viable and affordable.

HCP delivering diabetes health education has the opportunity to be a significant factor in helping create positive behavioral changes in diabetes management (White et al., 2015). Internet-based tools need more exploration as different avenues to change behavior. In particular, using these tools may have a considerable impact on more vulnerable (low social economic status, rural, and diversified languages) populations with diabetes. The impact on health outcomes may be more substantial for this population because of the numerous barriers may be applied to these groups of people. The need for more quality communication with their HCPs would help them obtain higher treatment satisfaction and lower medication non-adherence (White et al., 2015).

In 2014, Diabetes Care sponsored a systemic review and meta-analysis of computer-based interventions to improve self-management in adults with T2DM (Pal et al., 2014). This systematic review of the literature included all relevant studies published before 2012. In total, these studies had approximately 3,578 participants spread among 16 studies, all using randomized trials. One study had three intervention arms: clinics, the

Internet, and mobile phones. The results showed that there was little benefit to computerized interventions in terms of glycemic control as measured by A1C, but the mobile phone-based interventions demonstrated a larger numerical effect (Tildesley et al., 2014). Several secondary variables that were also studied included depression, QoL, blood pressure, serum lipids, and weight. The secondary variables showed no evidence of improvement (Tildesley et al., 2014). This analysis of the individual studies confirmed that using alternative forms of education and communication might improve blood sugar control, health status, and satisfaction with healthcare (Tildesley et al., 2014). However, unlike my study, none of these studies considered chronic limitations, self-perception health status, and satisfaction with healthcare for non-insulin and insulin dependent diabetics, in terms of the different forms of communication and how specific demographic groups might respond.

Tildesley et al.'s (2014) study had a variable number of participants, ranging from 30-886 in a single study, which made it difficult to draw an accurate assessment of the results. In addition, these studies only had three references to psychological theories and no mention of the HBM, though one did mention the SCT (Glasgow, Kurz, & King, 2010; Glasgow, Nutting, & Toobert, 2006; Quinn et al., 2011). All these studies were randomized but not blinded; the study design was the main reason cited for this choice (Tildesley et al., 2014). Another factor to consider was the length of the interventions, which was as low as 30-minute exposures, all the way up to 18 months. In these studies, the A1C level was the primary independent variable for 10 computer-based studies, while two did not mention A1C (Tildesley et al., 2014). For example, when comparing these studies for consistency, one telephone study ran for least 12 months with the A1C variable (Quinn et al., 2011), while one Internet-based study ran for 18 months but had no A1C variable (Lorig, Ritter, & Laurent, 2010). Overall, the studies were similar, but each study used many different dependent variables to draw a strong conclusion about the benefits of alternate technology on blood sugar management.

These studies were based all over the world and at different time periods, making it difficult to compare results due to technology advances (Tildesley et al., 2014). The most important aspect of these settings was that the United States had seven computer-based studies that ran from 2000-2011, whereas U.S. clinics were the setting for five studies conducted from 1986-2006 (Tildesley et al., 2014). There were two clinical studies from Australia and England, and three other mobile phone or Internet-based studies came from South Korea or China (Tildesley et al., 2014). The computer-based or mobile phone studies might have had some difficulty in the earlier years of study due to issues with Internet connections, bandwidth, cell tower reception, and device speed during these years. The interventions were not spelled out in this article, which created a need for more information about this topic (Tildesley et al., 2014). By using secondary data, I produced a more consistent analysis.

Internet usage may be the missing link in supporting a patient with diabetes at home. An organization called Providing Resources for Independence through Diabetes Education (PRIDE) was established through a National Institutes of Health (NIH) Planning Grant (Camp et al., 2015). This group implemented a study of CDE connections with elderly T2DM and MCI (MCI – early stages of dementia) cognitively impaired patients who lived independently in their respective homes. The participants had access to an IPad to use the Internet (Camp et al., 2015). The goal was to provide education and medication adherence and keep the patients out of assisted living to give them more independence. This study focused on A1C and cholesterol (Camp et al., 2015). The PRIDE study showed a significant difference while patients were in contact with a clinician via iPad, but once the contact stopped, the labs returned to baseline levels. This may suggest a need for continuous contact with clinicians via online in addition to FTF contact, to enhance QoL for a longer period of time (Camp et al., 2015). I helped clarify the missing relationship between alternative communications and better health outcomes for diabetes patients in my study.

Internet-Based Communication With HCP

Online self-management websites provide an advantage to patients with T2DM: Patients become self-reliant on the skills they were taught to help them change their behaviors (Yu et al., 2014). This educational approach produces a patient-centered approach. There are significant reasons to use self-management websites, especially because patients can incorporate these into their routines; these are easy to use; and these features goal-directed usage. Since web-based resources are so easy to use, many times diabetes patients specifically ask for computer-based resources for chronic disease management (Yu et al., 2014).

HCPs also have the responsibility to encourage patients to self-educate on their disease process by offering reliable resources on the web (Cooper & Kar, 2014). Social networks, blogs, and patient self-help sites provide valuable resources, where the diabetes patient can share experiences comments with other people in a similar situation. The HCP should help empower the patient by helping them find reliable most useful Internet resources (Cooper & Kar, 2014).

The biggest concern about retrieving disease information from a website is whether it contains reliable and accurate information. The accuracy and reliability of any health information website requires evidence-based information, as an HCP would be relaying the information on a generalized rather than an individualized basis. Saglam and Temizel (2015) explored this idea to rank 55 diabetes websites for accuracy and reliability. In their study, a proposed framework predicted good results compared to the current non-automated information quality measuring approaches used in the literature. When they applied the two methods of reliability to websites, their method had a 0.68 r score on the average, with $p < 0.001$, versus the average 0.33 r score for the proposed method used in the literature (Saglam & Temizel, 2015). Saglam and Temizel (2015) stated that there were sufficient numbers of reliable diabetes websites for the HCPs to refer the patients to them.

An additional researcher stated that finding reliable health information on the Internet might be challenging, but there was a method called health information concentration (HIC), which was an indicator to measure health information quality (Liu, 2014). The HIC technique works on most search engines; it evaluates the web page in terms of ethical quality standards and credibility perceptions of readers. HCPs can use it to evaluate whether a website is a reliable source for referrals. This technique uses an algorithm that is deployed to estimate if the site is reliable (Liu, 2014). The HIC method did have higher scores with diagnosis, treatment, and prevention of specific diseases.

Satisfaction With Healthcare and Health Status: Internet-Based Education

As of 2006, there was a worldwide shortage of 4.3 million healthcare workers, including midwives, doctors, nurses, and support workers (Seret, Dunning, Belton, & Mclaughlin, 2015). Within this group, certification in diabetes represents an even smaller percentage of HCPs. According to the Association of American Medical Colleges, there will be a shortage of more than 90,000 physicians in the United States by 2020 (Raymond, Madden, Ferretti, Ferretti, & Ortoski, 2014). There are approximately 18,000 CDEs and about 750 Advanced Diabetes Educators (BC-ADM) in the United States, as of 2014 (Burke et al., 2014). Education is the pinnacle of diabetes management, and it would be imperative to have most HCPs comfortable enough to help their patients manage diabetes (Seret et al., 2015). Due to the lack of HCPs with specialized diabetes training, there may be a need for additional resources, such as social media and web-based diabetes education. There was a need for more research on the benefits of utilizing these alternate forms of communications to supplement FTF education programs. These additional resources might cover a gap in education when the HCP cannot support the patient directly in diabetes management.

T1DM patients are mostly younger patients, adolescents, and children, and they are also in need of diabetes education. The biggest challenges to having these patients participate in standardized diabetes management education groups include time constraints, afterschool activities, and cost (Grey, Liberti, & Whittemore, 2015). These programs may have a significant out-of-pocket cost attached if the insurance does not cover the treatment. Grey et al. (2015) estimated the cost of two types of programs for T1DM: TEEN COPE and Managing Diabetes. The development costs for these programs in 2013 were $324,609 over 1.5 years, mostly for personnel to develop the program and get feedback from teens. Then, the maintenance was around $137 per patient over 4.5 years or $43,845 per year (Grey et al., 2015). Grey et al. (2015) delved into the cost savings for providing education on the Internet, but they also discovered that better blood sugar control was also a cost saving over time because patients developed fewer complications of diabetes. More in-depth research might be needed to identify the cost savings of long-term blood sugar management.

In reference to providing education in an alternate form, Patel et al. (2015) identified better control in blood sugar management. In this study, even a Digital Video Disc (DVD) was deemed acceptable for providing information. The DVD had more acceptability for a visual resource for understanding insulin and changing attitudes to accept the next steps in diabetes management (Patel et al., 2015). Patel et al. (2015) investigated whether patients changed their negative attitudes toward insulin injections after they and their HCPs viewed a well-planned out DVD on the subject. At the end of the study, the negative attitudes were indeed mitigated. This attitude change may alleviate the increase in stress a patient may have with an insulin injection and help him or her better understand the need for the insulin. The patient’s adherence to insulin injections would create a better health outcome due to better blood sugar control and a better overall health status, even though the education delivery was not FTF.

According to the CDC (2014b) and the National Diabetes Surveillance System (2014), 57.4% of adult patients with diabetes in the United States attended at least one Diabetes Self-Management Class following their diabetes diagnoses from 2012-2014. Education has been the key to fewer diabetes-related complications (ADA, 2016). It is imperative to keep their A1C less than 7% for all patients with diabetes because they will develop fewer complications and better health status.

Researchers determined that only 52% of all diabetes patients over 40 years of age kept their A1C levels below that level (Raidi & Safaii, 2015). Researchers at the University of Idaho had an idea to reach a broader range of people with diabetes. The researchers utilized the Internet, virtual world, and some social media sites to promote the plate method for teaching proper eating to diabetes patients (Raidi & Safaii, 2015). The website was developed in 2009 to include video clips that teach interactive English and Spanish meal planning techniques, and as of 2011 provided virtual grocery store tours. This website also contains a virtual kitchen and two virtual restaurants. The virtual world accelerates the patients’ kitchen skills and improves their ability to prepare a diabetes meal plan. The participants order food at a restaurant and select food at a buffet, thus enhancing their ability to make significantly better decisions in real-world situations (Raidi & Safaii, 2015). In 2015 to 2016, adults above 45 years of age used social media 60% of the time. Using social media and interactive virtual worlds would be a benefit in exploiting their effectiveness to educate patients (Raidi & Safaii, 2015). Unfortunately, there were few studies investigating this avenue.

According to Sheibe et al. (2015), some of the new suggestions are to have alternative sessions online, more communications with patients via texting or phone calls, social media support, and webinars at no cost for the patients, so they can develop better self-management skills (Bond et al., 2010; Prezio et al., 2014). This would then produce better blood sugar control, greater satisfaction with healthcare, and better health status. These alternative ways of communication have proven to impact behaviors for the good of the patient, yet there have been few endorsements from HCP to support this movement. Several scholars have mentioned the need for more research focusing on alternative methods of diabetes education for patients, given the barriers to attending FTF sessions with an HCP (Hunt, 2015; Raidi & Safaii, 2015).

After reviewing the literature, there seemed a lack of research articles addressing how HCPs could support patients with T2DM using the new avenues of communication, to empower them to change their behaviors for better QoL. Web-based and other alternate ways of communicating about diabetes management skills with professionals have improved health outcomes with T2DM patients (Hunt, 2015; Raidi & Safaii, 2015). In my study, I will create a better understanding the relationships among the different variables, such as chronic limitations, satisfaction with healthcare for non-insulin and insulin dependent diabetes, and self-perception health status in terms of FTF vs. alternative forms of communication (e.g., chat rooms, texts, or phone calls) with specific demographic groups.

Utilizing the Internet may also help decrease race disparities in individuals’ health queries, and it may help HCPs better understand cultural differences (Chae et al., 2015).

The creation of racial attitudes in a geographic area may be due to isolation and segregation; thus, Internet-based searches may help clarify attitudes, beliefs, and actions that may not be socially acceptable, such as racism (Chae et al., 2015). Diabetes statistics differ among different racial groups and individuals with different cultures. For example, African-American patients typically experience higher rates of complications: blindness, cardiovascular disease, kidney failure, and lower-extremity amputations (Jack et al., 2014). According to one study, African-American men were 2.7 times as likely to start treatment for diabetes-related end-stage renal disease compared with non-Hispanic White men in the year 2008 (Jack et al., 2014). The differences between these cultures may be due to their environment. The physical environment may create barriers related to options for physical activity, access to healthy foods, and neighborhood safety. The Internet-based diabetes education platforms may help facilitate goal setting within patients' community parameters to meet their health and community needs (Jack et al., 2014). In this way, I helped explain the relationship between the different ethnic backgrounds and alternate forms of communication with HCPs.

Lifestyle Self-Management Behaviors: FTF vs. Alternative forms

Communication with HCPs may impact a patient's lifestyle self-management skills and QoL Mastering diabetes self-management skills are essential to improving long-term QoL, as is ongoing support from an HCP (Janiszewski, O'Brian, & Lipman, 2015). The patient needs to learn these skills in diabetes self-management education (DSME) classes. These classes involve healthy coping, reducing risks, problem-solving, and developing techniques for blood sugar monitoring (Janiszewski et al., 2015). The other primary goals of DSME include healthy eating, physical exercise, decreasing stress levels, medication management, blood sugar management (high and lows), and keeping appointments with HCPs. After the education, an emphasis on support would be paramount for the patient's success.

Psychological issues are always a significant factor to consider with diabetes self-management, as these will influence QoL (Janiszewski et al., 2015). Diabetes knowledge may not always be associated with a patient's perception of how to take care of his or her diabetes self-management because the illness may have a different meaning to each patient (Williams, Walker, Lynch, Voronca, & Egede, 2015). Perception of the disease may help or hinder self-management skills. The HCP must help patients identify and cope with stress because this competency will decrease the numerous problems that develop as diabetes progresses, even if they know little about how diabetes progresses (Williams et al., 2015).

A unique study reviewed diabetes education and improved the approach to diabetes education to a virtual level (Rosal et al., 2014). The randomized participants were female African American T2DM patients living in an urban area, and the researchers developed virtual world diabetes self-management education (using the Second Life platform) and compared it to FTF education (Rosal et al., 2014). A virtual world is "a computer-generated, three-dimensional representation of a setting in which the user of the technology perceives themselves to be and within which interaction takes place; also called virtual landscape" (Dictionary.com, 2015, para. 1). The Second Life (2015) platform is the largest virtual world 3-D game system on the web. This virtual world diabetes study was one of the first of its kind and has opened more avenues to research alternative avenues of diabetes education.

Rosal et al. (2014) examined many aspects of satisfaction with diabetes management, but they started by displaying the cost of the research. The virtual world was slightly more expensive than FTF education because of the technical support needed during the study. The number of participants was small: $n = 46$ in the virtual group and $n = 43$ in the FTF group. Rosal et al. believed that the cost would decrease if more people used the virtual world technology. There was no significant difference in the groups' diabetes health outcomes after an 8-week study (Mitchell et al., 2014). Satisfaction with diabetes education in both of the groups was similar, and 80% of the participants in both groups stated that they would recommend diabetes education after the study (Mitchell et al., 2014).

The virtual world is an exceptionally progressive secondary approach to self-management diabetes education. Within Mitchell et al.'s (2014) study, each patient could pick an avatar to represent him or her in the virtual world. This avatar helps propel users' socialization within the virtual world because they can customize it. The participants accessed the virtual world from their homes, which decreased numerous barriers to attending FTF classes. The majority of these participants were high school graduates with lower household incomes, and they had variable computer skills. These are the exact demographics that would benefit from alternative forms of education because of the significant barriers to attending traditional diabetes FTF education (Mitchell et al., 2014). The virtual world study helped the National Institute of Diabetes and Digestive and

Kidney Diseases and the National Heart Lung and Blood Institute launch research priorities with virtual reality technologies to promote better health-related behaviors and extend the access to classrooms and HCPs in areas beyond diabetes education (Rosal et al., 2014).

Satisfaction With Healthcare and Health Status: FTF vs. Alternative

Satisfaction with communication between the HCP and the patient also needs to be improved, because patients with better blood sugar control have typically received better information about diabetes more promptly (ADA, 2016). The increased speed of communication exchange between HCP and patient, may be time sensitive if the patient is having a low blood sugar. Low blood sugar needs immediate attention, or the patient health status may rapidly decline. Rapid exchange of information may be facilitated through social media and other websites. Web-based communication between HCPs and patients have become very popular. In fact, among all online users, about 80% have proactively searched for health solutions (e.g., treatment for a specific disease) on the Internet (Lu et al., 2013). Among this group, 34% have researched blogs, specific communities, and even websites on specific health issues (Lu et al., 2013). Free web-based interventions (as distinct from telehealth or telemedicine) have the potential to bridge the gaps in diabetes care and self-management (Yu et al., 2012).

Interventions using social media, phone calls, emails, or texts are also viable solutions for better blood sugar control because the patient may not have insurance or have a high deductible. Therefore, I analyzed the relationships between forms of communication and variables that impacted the QoL for participants with diabetes, and ultimately affected their satisfaction with healthcare. These relationships might encourage more research or clinical practices to change the way they communicate with or educate their patients.

Summary and Conclusions

This literature review examined many aspects that identified the gaps in research for the proposed study. Specifically, I addressed the relationship between FTF and alternative forms of communication in terms of patients ‘chronic limitations, satisfaction with healthcare non-insulin and insulin dependent diabetics, and self-perception health status with specific demographic groups. The literature demonstrated that there was a need for diabetes information that was reliable, accurate, and timely for patients with T2DM. The research also covered several reasons why patients might have to overcome numerous barriers to manage their diabetes, such as the cost of healthcare, medicine, education, and the lack of culturally acceptable education. The literature identified the need for more accessible diabetes communication due to these costs, a lack of referrals or education, convenience, patients’ hesitance to attend class based on stigmas, and HCPs’ lack of specialized education on diabetes self-management. Using alternative sources of diabetes information offers additional support to the patient’s regular HCP check-ups (Mitchell et al., 2014). However, the literature did not identify an immediate need for alternative information on diabetes management to help patients have a better QoL, or whether patients are satisfied with their current traditional FTF-only HCP contacts. The researchers in the literature did state that with more information, patients could self-manage their disease and have better QoL and decreased chronic limitations. There were numerous studies that explained how communication, education, and information might improve or even change behaviors for a better QoL. However, not one of these studies covered these variables or compared these with the different methods of communication with HCPs and with comparing the demographics on the influence on the variables.

To fill these gaps, I focused on SCT with some explanation using the HBM. SCT helped identify many aspects of how and why a person my change his or her behavior, and why it would be beneficial to combine both avenues of contact with patients for better health outcomes. Currently, the research in this field did not focus on this theory in terms of the variables discussed above. Utilizing a quantitative approach, the objective of this study was to generate numerical data and use statistical methods to establish whether there was a difference between individuals with diabetes who attended FTF session with an HCP and those who participated in FTF through phone calls and email communication. The different modes of communication with a HCP was analyzed, the results determined that there was no relationship between chronic limitations, self-perception health status, and satisfaction with healthcare for non-insulin and insulin dependent but had a significance with specific demographic groups.

Chapter 3 addresses the methodology of the study. The chapter will discuss the research design, hypotheses, data collection, methods, sample population, and data analysis. It will also discuss the ethical considerations for this study.

Chapter 3: Research Method

The purpose of this quantitative, cross-sectional study was to explore the possibility of an association between chronic limitations, self-perception of health status, and satisfaction with health care for individuals with non-insulin-dependent and insulin-dependent patients with diabetes. The comparison was based on their current method of receiving diabetes communication. Educational communications were examined to determine whether there was a difference in health outcomes and perceptions. Specifically, health outcomes and perceptions were examined for participants who received FTF educational communication only and those who received FTF communication, as well as using chat rooms, health information on the Internet, and emails (alternative forms of diabetes communication). The data were collected from a secondary source: the 2016 National Health Interview Survey (NHIS). An analysis was completed on the above variables to identify any significant relationships. The other surveyed factors included demographics of age, gender, race/ethnic background, and education.

This chapter includes a discussion on the research design and rationale, methodology (including population, sampling, and sampling procedures), procedures for archival data, instrumentation and operationalization of constructs, the data analysis plan, threats to validity, ethical considerations, and summarization. To test each of the research questions, I presented the independent, dependent, and covariate variables, as well as how the research data were collected from an archival source and analyzed to understand the relationships between the dependent and independent variables.

Research Design and Rationale

In this quantitative, cross-sectional study, I used secondary data from a 2016 questionnaire administered by the NHIS. The surveyed population participants included diagnosis of diabetes, ages 18-80, non-institutionized

Dependent Variables

The dependent variables for this study included the participant's chronic limitations, self-perceived health status, and health care satisfaction for non-insulin-dependent and insulin-dependent patients with diabetes

Independent Variables

There was one independent variable: type of educational communication. The first level of the variable was FTF educational communication received directly from an HCP. The second level of the variable was FTF with alternative forms of educational communication, which was determined by whether the participant received their diabetes education/communication via the Internet, email, or phone in addition to FTF.

Covariate Variables

The covariates for this study included age, sex, race/ethnic background, and education. The demographics ranged from 18-80 years old, the race included White, Black and other and included education level from none to post graduate level.

Research Design

I used a quantitative cross-sectional design for this study. The primary source of data was secondary data extracted from the 2016 NHIS. The advantages of using a cross-sectional design included the data being analyzed using the same group of participants with diabetes, yet using different statistics to show a relationship between two groups (Charan & Biswas, 2013). The cross-sectional design takes a snapshot in time where multiple variables may be analyzed at one time (Sedgwick, 2014). The main constraints in utilizing secondary data, would be if a researcher would repeat the study in a future year; hence, the participants might not be the same (Sedgwick, 2014). I explored the connection between diabetes chronic limitations, current self-perception health status, and health care satisfaction with non-insulin and insulin dependent diabetes participants between covariates and analyzed how the variables might relate between the two groups.

My cross sectional quantitative study utilizing NHIS secondary data might have limitations, but this survey was chosen due to its large sample size and the fact that all the interviewers were trained to give the survey. This design fit my financial constraints. The NHIS survey has been conducted every year since 1957; the NHIS survey is a cross-sectional household survey by the CDC (2015d) and the NCHS (Zhang et al., 2014). I chose the 2016 NHIS survey because its data were easy to access, and its multiple variables are effective in answering the research questions. Finally, experts in the public health field have classified the NHIS survey as reliable data (Parsons et al., 2014).

The NHIS data set has a very clear definition for diabetes diagnosis. The interviews clarified the diabetes status of participants in the following responses. The NHIS identified participants with diabetes during interviews with adult respondents. The participants stated whether or not they had been diagnosed with diabetes by an HCP. Women with gestational diabetes were excluded from the sample (CDC, 2015d). The NHIS had specific parameters for how long a participant needed to have been diagnosed with diabetes, which eliminated any ambiguous self-reported diabetes responses (CDC, 2015d). The official diagnosis of diabetes has three criteria to be met. The first one is HgbA1C (A1C) has to be greater than 6.5%. The second, a fasting blood sugar greater than 126mg/dl more than twice. The third is the blood sugar has to be greater than 200mg/dl with sign or symptom of high blood sugars (polydipsia, polyphagia, or polyuria; ADA, 2016; CDC, 2015d). The diagnosis criteria were used in the NHIS data collection.

For this study, I used a quantitative, nonexperimental cross-sectional design. The dependent variables were chronic limitations, health care satisfaction for non-insulin-dependent and insulin-dependent participants and their self-perception of their health status. The independent variable was classified into two contrasting groups: FTF and FTF with alternative forms of educational communication. The researchers made a comparison assessment of the relationship between the independent variable and each of the dependent variables. The demographic variables also helped identify specific groups of participants who might be influenced by the different variables in the two groups. Demographic variables were included in the analysis to determine the impact on the association between the primary variables of interest.

Research Questions and Hypotheses

In this study, the following research questions guided the null and alternate hypothesis:

Research Question 1 (RQ1): Is there an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes?

Null Hypothesis ($H_0$1): There is no association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Alternative Hypothesis (H_a1): There is an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Research Question 2 (RQ2): Is there an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes?

Null Hypothesis ($H_0$2): There is no association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Alternative Hypothesis (H_a2): There is an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Research Question (RQ3): Is there an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes?

Null Hypothesis ($H_0$3): There is no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Alternative Hypothesis (H_a3): There is an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Research Question (RQ4): Is there an association between type of diabetes education and self-perception health status among individuals with diabetes?

Null Hypothesis ($H_0$4): There is no association between type of diabetes education and self-perception health status among individuals with diabetes.

Alternative Hypothesis (H_a4): There is an association between type of diabetes education and self-perception health status among individuals with diabetes.

The research model always influences the outcome of the research study (Rudestam & Newton, 2007). There are numerous quantitative research designs, but most researchers opt to compare or find the correlation between two or more variables between two groups. I chose to explore the correlation between FTF diabetes educational communication and FTF with alternative forms of educational communication among the dependent variables of chronic limitations, self-perception health status, and satisfaction with healthcare with non-insulin and insulin-dependent participants with diabetes with specific demographic groups. I used the 2016 NHIS data set.

The research method was the quantitative, cross-sectional method. The purpose of this method is to test objective theories by explaining the relationships among variables (Creswell, 2013). I did not choose either a qualitative or a mixed-methods approach because the purpose of the qualitative method is to use an inductive style of collecting data based on exploring a human problem relating to social interaction, as suggested by Creswell (2013). A mixed research method is based on both the quantitative and qualitative methods. Thus, because qualitative methods were not appropriate for this study, a mixed methods approach was also not appropriate.

Due to my decision to use quantitative methods for the research, the study involved an analysis to determine if there was an association between the dependent variables compared to the independent variables. The NHIS used a multistage stratified method of sampling. The method of data collection was structured questionnaires completed through an interview process. I used the data from the 2016 NHIS data set. The information collected were used to generalize from the population sample.

I did not choose the experimental design because the purpose of this study was not to show how an intervention may influence the outcome. Experimental research may be best used for a longitudinal study, which consists of surveying or observing the same set of individuals with the same variables over long periods of time, sometimes even decades. Due to the dissertation process and the fact that the NHIS did not survey the same individuals every year, I did not choose a longitudinal approach, and instead opted for a nonexperimental cross-sectional method.

NHIS

U.S. Census Bureau interviewers conduct an annual multistage probability sample survey in households. Known as the NHIS, the survey is conducted by the Centers for Disease Control and Prevention's NCHS. The Researchers for the NHIS used approximately 750 interviewers (i.e., field representatives) to conduct the 2016 NHIS interviews (Department of Health and Human Services, 2016). The U.S. Census Bureau's performance and data analysis program (PANDA) system trained and supervised the interviewers. Every question asked by the interviewers was a part of this study's variables.

Under the simple random design, the NHIS knew in advance that some ethnic groups, such as Black, Hispanic, and Asian populations, would not be sampled sufficiently. As such, the NHIS made adjustments in order to meet its stated survey objectives. Besides the other issues addressed in the research, the primary goals in the sample design were to improve the reliability of the statistics for economic, ethnic, racial, and geographic domains (CDC, 2015a, 2015e). Due to survey resource constraints, the survey methods included clustering, stratification, and over-sampling of the unique population’s subgroups. Based on the concentration of Black, Asian, and Hispanic persons, the U.S. Census Bureau partitioned each selected non-self-representing (NSR) or self-representing (SR) primary sampling units (PSU) into substrata of census blocks or combined blocks (Parsons et al., 2014). The race and ethnicity density substrates were defined according to the population concentration from the 2000 Decennial Census. This census included new housing within a PSU as its substation to produce the most current sample of households.

One component of the NHIS sample was assigned to be screened prior to interviewing. The screening process is an interviewing procedure to determine which households meet minimum specified criteria (CDC, 2015b). For example, a household without civilian Black, Asian, or Hispanic members might not be given a chance to take the full-length interview. The preselection of interviewees was calculated in a NHIS screening process (CDC, 2015b). This process should be initiated in the beginning of the interview before the household composition is determined (CDC, 2015d). The NHIS interview proceeded through the collection of household rosters for this sample. The interview continued only if the household roster contained one or more Black, Asian, or Hispanic persons. Otherwise, the interviewer terminated the interview, and the household was deemed screened out.

In another part of the NHIS sample, full interviews occurred in all households. The proportion of the NHIS sample that was assigned to be screened varied across the 21 substrata (CDC, 2015d). For the selected dwelling units, the NHIS collected some information about all persons living in the unit. For example, the interviewers randomly selected one adult per family to complete the questionnaire. In the previous NHIS sample design, all adults in a family had the same chance of being selected as the sample adult. In the new NHIS sample design, the institute gave any Black, Asian, or Hispanic adults aged 65 years or older twice the chance of being selected as the sample adult compared to any other adult in the family (CDC, 2015d). They implemented this new procedure to increase the proportion of sample adults who were Black, Asian, or Hispanic, and 65 years or older (CDC, 2017).

When selecting participants for the sampling, one concern was to ensure that each participant could satisfy disclosure constraints. The disclosure limitations were the collecting of statistical data while protecting the individual identification and release of data to other research sources (Hundepool et al., 2012). The original design of the interview was withheld from the public, which included the substrate, strata, secondary sampling units (SSUs), hypothetical substrata sampling parameters made up of clusters of Housing units in a multiple of four—and PSUs, by applying the cluster technique, collapsing, mixing, and partitioning the original design variables. These simplified design structures were not designed to support geographical analysis below the census region level. The disclosure consent became essential to file due to the sampling and the potential for the design variables to be influenced by the sampling method.

Cross-Sectional Design

Cross-sectional research is a type of observational study that collects data from a population or subset of the population at a specific period of time (Kanchanaraksa, 2016). This study involved the use of data from the 2016 NHIS survey because this was the most recent data available. In 2014, the institute added questions about Internet, chat rooms, and email usage to the questionnaire. Cross-sectional research had the advantage of studying several variables at the same time. The one disadvantage of choosing this study design was that the results might not pinpoint a definite cause-and-effect relationship. These results only demonstrated a snapshot of a moment in time and not looked at what happened before and after the survey. The research questions might only be considered accurate at the time the participant answered the questionnaire. Nevertheless, this study was appropriate because it enabled me to estimate the sample's prevalence of chronic limitations, self-perceived health status, and healthcare satisfaction while on insulin or oral medication.

Methodology

Population

The target population for the 2016 NHIS was all non-institutionalized individuals over the age of 18-years-old living in the United States. Non-institutionalized is defined as persons who currently reside in the United States or the District of Columbia and do not live in any institutions, including mental facilities, prisons, or facilities for the aged (Parsons et al., 2014). The second criteria would be that the person was not currently active in the United States Armed Services.

Sampling and Sampling Procedures

The 2016 NHIS conducted the initial survey in-person with some telephone follow-up. The interviewers were trained U.S. Census employees with computer-assisted personal interviewing software. The NHIS conducts this survey annually and repeats for cross-sectional estimates (Parsons et al., 2014). The original NHIS sample design began in 1995 with an updated design in 2006. The institute introduced the most recent sample design in 2016. When the NHIS designed the parameters for sampling, their primary focus was to interview 47,000 American households per year (Parsons et al., 2014). Households are defined by three or more individuals living in a dwelling at one time (CDC, 2015b). Thus, my targeted sample population utilized a multi-step method partitioned into several affiliated levels of strata and clusters for the massive number of interviews accomplished.

For the survey, the NHIS utilized a multistage area probability design (CDC, 2015d). They used the multistage sampling method to help obtain a representative population sample of U.S. households. The survey's PSU consisted of specific geographical areas and the option of selecting groups of three no certainty sample PSUs in to the sample as a group (CDC, 2015b). The PSU included counties or groups of contiguous counties. The sampling started to stratify blocks by using a sample in a systematic method based, in part, on each block's number of housing units (HU; CDC, 2015b). These consolidated sampled blocks to form SSUs. Each SSU was part of a super-SSU, consisting of 12 geographic clusters of an annual SSU sample, one for each year of the design. The sampled results from four separate housing units could be analyzed and weighted to produce a representative sample of the U.S. non-institutionalized population. The NHIS data did oversample to insure demographically diverse sample with the African American and Latino ethnic backgrounds.

2016 NHIS with diabetes current study sample. I obtained sampling procedures from the 2016 NHIS and utilized the data to answer research questions. In 2016, of the 33,028 individuals interviewed, 3,540 were diagnosed with diabetes (Department of Health and Human Services, 2016). The researchers for NHIS used the following procedure to gather the sample. They divided the number of people interviewed over the total number of people who were eligible to participate in the survey (interviewed sample adults/eligible sample adults). They calculated the final sample by response rate of interviewed sample adults/eligible sample adults from interviewed families multiplied by the final family response rate (Parsons et al., 2014).

In 2016, 40,220 households had a total of 97,169 persons in 40,875 families with 33,028 sample adults and 11,107 children (Parsons et al., 2016). There were approximately 511 proxy cases, a knowledgeable proxy answered for the sample adult. By dividing the adults interviewed (33,028) by the eligible individuals (40,848), the institute calculated an 80.9% response rate. Dividing the number of adults with diabetes (3,540) by the adults interviewed (33,028), the NHIS determined a 10.7% eligibility rate.

Power analysis. A power analysis was conducted using G*Power 3.0.10 to calculate the expected difference in the number of participants who communicate with their HCP FTF versus FTF with alternative forms of communication to determine sample size. The sample size was calculated using the *f* test in G*Power for the sample size. The power analysis involved a regression to determine this association. An estimate was generated for each research question. The projection of the sample size did reflect the probability of rejection of the null hypothesis when the specific alternative hypothesis is true (Faul, Erdfelder, Lang, & Buchner, 2007).

The power analysis considered the following assumptions: two-sided significance using .05 (1-apha), 80% Power (1-beta, % chance of detecting), and 80% ratio of sample size (Faul et al., 2007). The effect size was based on the frequency of the outcome of interest and used to calculate the G*power. Through unstandardized measures, I considered the raw difference between the group means and raw regression coefficients. The power sensitivity was calculated for the probability of finding a true effect when one does exist. The type 2 error calculation explained incorrectly accepted the null hypothesis (false negative) in order to minimize the risk of failing to detect the real effect. The significance (*p*-value; .05) calculated the probability that an effect occurred by chance alone. *P*-values between 0.01 and 0.05 indicate that it was statistically significant and adequate evidence against the null hypothesis. When the *p*-values are greater than 0.05, generally, there is insufficient evidence against the null hypothesis. Type 1 error was utilized for the incorrect rejection of the null hypothesis. To minimize the risk of detecting a non-real/spurious effect, I considered the value of .05. The .05 was the effect size used in the sample size calculations.

The type of power analysis was priori. The required sample size was computed with the necessary sample size = (Z-score)^2 * Std Dev*(1-StdDev) / (margin of error)^2. The confidence interval was 95% level, .5 standard deviation which is a margin of error of +/- 5%. The equation would be, $(1.96)^2$ x .5(.5) / $(.05)^2$, then equals 3.8416 x .25 / .0025, which equals .9604 / .0025 then equals 384.16. So, I needed 385 participants for the sample size (Faul, Erdfelder, Buchner, & Lang, 2008). This equation was performed on each RQ. I utilized the same data base for each research equation.

Sample size for RQ1. I began analysis for RQ1 by calculating descriptive statistics on the dependent variable (chronic limitations), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a multivariate logistic regression to test the association between type of interaction and odds of reporting a chronic limitation while controlling for each of the demographic variables. The sample size was calculated for logistic regression.

Sample size for RQ2. I began analysis for RQ2 by calculating descriptive statistics on the dependent variable (healthcare satisfaction who are non-insulin dependent), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a simple linear regression to test the association between type of interaction and healthcare satisfaction who non-insulin dependent while controlling for each of the demographic variables. The sample size was calculated for simple linear regression.

Sample size for RQ3. I began analysis for RQ3 by calculating descriptive statistics on the dependent variable (healthcare satisfaction insulin dependent diabetics), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a linear regression to test the association between type of interaction and healthcare satisfaction while on insulin considering demographic variables as covariates. The sample size was calculated for simple linear regression.

Sample size for RQ4. I began analysis for RQ4 by calculating descriptive statistics on the dependent variable (perceived health status), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a simple linear regression to test the association between type of interaction and perception of health status while controlling for each of the demographic variables. The sample size was for simple linear regression.

Instrumentation and Operationalization of Constructs

The CDC (2015d) used the NHIS to gather information on the health status of the U.S. non-institutionalized, civilian population. The NHIS began completing their survey in 1957, and the survey was continuous for almost the past 60 years (CDC, 2011). It was initiated as part of the National Health Survey Act of 1956 to obtain accurate and current information about illnesses and disabilities, the amount and distribution of resources, and the types of health services provided to the U.S. populace (CDC, 2011). The NHIS' Integrated Health Interview Series (IHIS) was used to examine trends in diseases and disabilities to provide the information for the development and tracking of national health objectives (CDC, 2014b). The IHIS was also used as a basis for policy provisions for health care, epidemiological data, and the evaluation of federal programs.

The public can freely access the IHIS dataset by registering on the website to gain access. This registration asked specific questions about downloading a customized data extract. The user must agree to the specified conditions of responsible use, which are similar to the conditions for using the NHIS public use files. The NHIS collects data from registered users for the purpose of internal recordkeeping and to provide the IHIS staff with a clear sense of the user constituency, which improves outreach and better serves users. Registration also requires users to provide information about themselves, such as their discipline, academic or non-academic status, and institutional affiliation. The application for data request is in Appendix A.

Published Reliability and Validity

In order to mitigate against the chance of error either on the part of the interviewer or the respondent, the U.S. Census Bureau programmed a consistent range of checks into the computer assisted personal interviewing (CAPI) system used for the NHIS, which edits and cleans up the data (Department of Health and Human Services, 2015). When erroneous data were entered into the system, an error message appeared on the computer screen. For example, if the interviewer intends to input 18 years old and instead inputs 180 years old, the CAPI system flagged this mistake. This interruption was called a *hard edit*, and the error must be corrected before the interview can continue. *Soft edits* were inadequate responses that enable the interview to continue (Department of Health and Human Services, 2015).

Although there was a significant amount of checks during the data entry process, the data still had to be *cleaned* or edited after each interview. The first step in this process was verification of the valid number of cases in the data file. The process showed for all initial data frequency to be produced and reviewed for reasonableness after verifying the number of cases and initial data frequency. An additional invalid values or unusual distributions were examined variable ranges and permissible values. If the invalid values occurred, the values were deleted. When blank values already existed for the variable, the values were checked to see if these were allowable or could be corrected to another related question. Records that were missing responses for unknown reasons were left missing (Department of Health and Human Services, 2016).

Operationalization of the Variables

The following Tables 1 through 4 show the proposed research questions, dependent variables, and independent variables, as well as the categorical/numerical unit of measurement. The research questions were illustrated right beside the associated variable(s). The diabetes variable was used to restrict the dataset so that only those with diabetes were included. The NHIS asked the question: Have you ever been told by a doctor or other professional that you had diabetes (DIABETICEV)? The interviewer coded the choices as *1=yes, 2=no, 7=refused, 8=not ascertained,* and *9=don't know*. For the purposes of this study, the researcher only used yes and no answers. The current study excluded *refused, not ascertained,* and *don't know* from the analysis. For the purpose of this study, having diabetes was a simple filter the participants to be the sample. The dependent variables included chronic limitations, health status, and satisfaction with health care with non-insulin dependent and while on insulin. The two independent variables included the form of communication variables: FTF educational communication or FTF with alternative forms of educational communication. The last part of this table displays the demographic variables: education, age, gender, and race/ethnic background.

Study Variable Codes

In this the study, the variable that was used for chronic limitations were chronic status of limiting diabetes (LHAL10T; CLIMDIABETC) and chronic status of functionality of limiting diabetes (FLDIABETIC). The variables that were used for satisfaction in healthcare for insulin- dependent and non-insulin dependent included the following: In general, how satisfied are you with your healthcare you received in the past 12 months? (HSCATIS12M); and are you now taking insulin? (INSULIN). The variable that was used for currently health status included the following: Would you say your health in general is excellent, very good, good, fair, or poor? (PHSTAT; HEALTH).

All the instruments for each dependent variable were analyzed between each independent group. The FTF group used the following variable: saw/talked to a general doctor in the past 12 months (SAWGEN). The alternative educational communication group used the following: Did you make a phone call to a doctor or medical professional? (IRMEDPCPOC); have you communicated with a HCP using email in the past 12 months? (PCEMAILHPYR); did you ever participate in a health chat in the last year? (PCCHATHELYR); and did you ever look up health information on the Internet in the last year? (PCLOOKHEYR). In the questions above, a yes or a no was the response to the question. If the person responds yes to the question, the participant used an alternative method.

Demographics

Education. For educational information (EDUC), the following categories were used: *1= No education/Kindergarten, 2= Grades 1-6, 3= Grades 7-12, 4= High School diploma/GED, 5= Some College,* and *6= College graduate or higher*.

Race/ethnicity. For race/ethnic (RACE) background, the following categories were used: White American, Black or African American, or others.

Age. For age (AGE), the following categories were used: 20–29. 30–39, 40–49, 50–59, 60–69, 70–79, and 80+ over. For the purpose of this study, I referred to the variable names (variable questions) to explain the study analysis.

Sex. For Sex (SEX), the categories were used: 1=Male and 2= Female.

Tables 1-4 were addressing each research question by highlighting the exact research variable. The variable questions that were asked to the participant (including demographics). The third column reflected the unit of measurement and the last column was statistical tests performed on each question.

Table 1

Quantitative Research Question 1: Is There an Association Between the Type of Diabetes Education Communication and Chronic Limitations Among Adults Diagnosed With Diabetes?

Research Variable	Variable Questions	Categorical/Numerical Unit of Measurement	Statistical Test
Chronic Limitations	Chronic State of limiting Diabetes (CLIMDIABETIC)	0= NIU 1= Chronic	Frequency and means, Logistic Regression, R value, $R^{2,}$ Sig change, β, Sig.
	Chronic status of functionality limiting diabetes (FLDIABETIC)	0=NIU 1= Chronic	
FTF with HCP	SAW/talked to general doctor in the past 12 months (SAWGEN)	1= Yes 2=No	
Alternative forms of communication	Did you communicate with HCP via email? (PCEMAILHPYR)	1=Yes 2=No	
	Did you make a phone call to a doctor or medical professional? (IRMEDPCDOC)	1=Yes 2=No	
	Did you ever look up health information in the last year? (PCLOOKHELYR)	1=Yes 2=No’’’’	
	Did you ever participate in a health chat in the last year? (PCCHATHELYR)	1=Yes 2=No’’’’	
SEX	Male or Female? (SEX)	1 = Male 2= Female	
AGE	What is your AGE?	< 30 30-39 40-49 50-59 60-69 70-79 80+	
Race/Ethnic Background	What ethnic background best describes you? (RACEA)	1=White 2= Black/African American	
Education background	What level of education did you achieve? (EDUC)	1 = No high school diploma 2= High School Graduate 3= Some College, no degree 4= 2 year degree 5= 4 year degree 6= Graduate degree	

Table 2

Quantitative Research Question 2: Is There an Association Between Type of Education and Healthcare Satisfaction Among Individuals With Non-Insulin Dependent Diabetes?

Research Variable	Variable Questions	Categorical/Numerical Unit of Measurement	Statistical Test
Health satisfaction	Satisfaction with Healthcare (non-insulin dependent) past 12 months? (HCSATIS12M)	1=Very Satisfied 2=Somewhat Satisfied 3=Very Dissatisfied 4=Have not had Healthcare	Frequency and means, Linear Regression, R value, $R^{2,}$ Sig change, β, Sig.
FTF with HCP	SAW/talked to general doctor in the past 12 months (SAWGEN)	1= Yes 2=No	
Alternative forms of communication	Did you communicate with HCP via email? (PCEMAILHPYR)	1=Yes 2=No	
	Did you make a phone call to a doctor or medical professional? (IRMEDPCDOC)	1=Yes 2=No	
	Did you ever look up health information in the last year? (PCLOOKHELYR)	1=Yes 2=No	
	Did you ever participate in a health chat in the last year? (PCCHATHELYR)	1=Yes 2=No’’’’	
SEX	Male or Female? (SEX)	1 = Male 2= Female	
AGE	What is your AGE?	< 30 30-39 40-49 50-59 60-69 70-79 80+	
Race/Ethnic Background	What ethnic background best describes you? (RACEA)	1=White 2= Black/African American	
Education background	What level of education did you achieve? (EDUC)	1 = No high school diploma 2= High School Graduate 3= Some College, no degree 4= 2 year degree 5= 4 year degree 6= Graduate degree	

Table 3

Quantitative Research Question 3: Is There an Association Between Type of Education and Healthcare Satisfaction Among Individuals With Insulin Dependent Diabetes?

Research Variable	Variable Questions	Categorical/Numerical Unit of Measurement	Statistical Test
Health satisfaction while on Insulin	Satisfaction with Healthcare past 12 months? (HCSATIS12M)	1=Very Satisfied 2=Somewhat Satisfied 3=Very Dissatisfied 4=Have not had Healthcare	Frequency and means, Linear Regression, R value, $R^{2,}$ Sig change, β, Sig.
	Are you now taking Insulin? (INSULIN)	1=No 2=Yes	
FTF with HCP	SAW/talked to general doctor in the past 12 months (SAWGEN)	1= Yes 2=No	
Alternative forms of communication	Did you communicate with HCP via email? (PCEMAILHPYR)	1=Yes 2=No	
	Did you make a phone call to a doctor or medical professional? (IRMEDPCDOC)	1=Yes 2=No	
	Did you ever look up health information in the last year? (PCLOOKHELYR)	1=Yes 2=No	
	Did you ever participate in a health chat in the last year? (PCCHATHELYR)	1=Yes 2=No’’’’	
SEX	Male or Female? (SEX)	1 = Male 2= Female	
AGE	What is your AGE?	< 30 30-39 40-49 50-59 60-69 70-79 80+	
Race/Ethnic Background	What ethnic background best describes you? (RACEA)	1=White 2= Black/African American	
Education background	What level of education did you achieve? (EDUC)	1 = No high school diploma 2= High School Graduate 3= Some College, no degree 4= 2 year degree 5= 4 year degree 6= Graduate degree	

Table 4

Quantitative Research Question 4: Is There an Association Between Type of Diabetes Education and Self-Perception Health Status Among Individuals With Diabetes?

Research Variable	Variable Questions	Categorical/Numerical Unit of Measurement	Statistical Test
Health Status	Would you say your health in general is excellent, very good etc. (HEALTH)	1=Excellent 2= Very Good 3= Good 4= Fair	Frequency and means, Linear Regression, R value, $R^{2,}$ Sig change, β, Sig.
FTF with HCP	SAW/talked to general doctor in the past 12 months (SAWGEN)	wil1= Yes 2=No	
Alternative forms of communication	Did you communicate with HCP via email? (PCEMAILHPYR)	1=Yes 2=No	
	Did you make a phone call to a doctor or medical professional? (IRMEDPCDOC)	1=Yes 2=No	
	Did you ever look up health information in the last year? (PCLOOKHELYR)	1=Yes 2=No	
	Did you ever participate in a health chat in the last year? (PCCHATHELYR)	1=Yes 2=No''''	
SEX	Male or Female? (SEX)	1 = Male 2= Female	
AGE	What is your AGE?	< 30 30-39 40-49 50-59 60-69 70-79 80+	
Race/Ethnic Background	What ethnic background best describes you? (RACEA)	1=White 2= Black/African American	
Education background	What level of education did you achieve? (EDUC)	1 = No high school diploma 2= High School Graduate 3= Some College, no degree 4= 2 year degree 5= 4 year degree 6= Graduate degree	

Data Analysis Plan

The 2016 NHIS database was a reliable secondary dataset to conduct the analysis. The public has access to the dataset website without limitation. I began the analysis with frequency and means tests on dependent variables: chronic limitations, healthcare satisfaction, and health status, the independent variables (FTF and FTF with alternative diabetes communications), and demographics (sex, age, race/ethnic background, and education background). The frequency test and means highlighted the sample size and the mean within each variable.

The analysis continued with a simple regression utilizing *R*-value, *R*-squared, significant change, beta, and significance. Beta and significance were tested on interaction type (the FTF with alternative forms of communication), in addition to the dependent variables healthcare satisfaction for non-insulin dependent and insulin dependent participants and self- perception health status. A logistical regression was performed on Research Question 1's chronic limitations due to the binary answer to the question. The beta was also calculated. Then, a significant change and significance were tested to this chronic limitation. The demographic variables were also controlled for as covariates for each dependent variable.

The simple linear regression began with a Pearson's *R* also known as *R*-value. The *R*-value measured the linear dependence (correlation) between the FTF group and the FTF with alternative diabetes communication among the dependent variables of healthcare satisfaction for non-insulin dependent and insulin dependent and self-perception health status. The demographic independent variables included sex, age, race/ethnic background, and education background. The *R*-value have a value between +1 and -1 inclusive; -1 was total negative linear correlation; 0 was no linear correlation; and 1 was total positive linear correlation (Field, 2013).

The next statistic test performed was the *R*-squared also known as the coefficient of determination. The *R*-squared was the number that indicates the proportion of the variance in dependable variance that was predictable from the independent variable (Field, 2013). The demographic independent variables included age, sex, race/ethnic background, and educational background. Dependent variables with independent demographic variables were tested to predict the FTF group or the FTF with alternative diabetes communication group. The simple linear regression was conducted to determine a significant change with the dependent variables and demographic variables with the two groups. A significant change indicated using a value of <.05.

The next and last two tests were the beta test and the significance test. This test was set up with all the dependent variables and control for demographic (sex, age, race/ethnic background, and educational level) with the second group (FTF with alternative forms of communication). The beta calculation indicated if the sample data could project to the population. The last test significance might have indicated among the dependent variables if there were different association between the groups and if the demographics have indicated a bigger significance.

To answer the research questions, the strength and direction of the relationship between the variables were evaluated at an alpha level of .05 (Green & Salkind, 2011). The first step in this evaluation was to perform an exploratory correlation analysis to visualize associations between variables. Then, a linear regression analysis was performed to evaluate the combined effect of independent variables on the dependent variable. A linear regression test was preferred over a logistical regression because the dependent variables (self-perception health status and healthcare satisfaction for non-insulin dependent and insulin dependent diabetes participants were not answered with categorical answers (Creswell, 2013). The demographics variables of age, gender, race/ethnic background, and education might be potential confounders for the association between the dependent and independent variables.

The hypotheses were tested on all three research questions with a power analysis, and then a linear regression among Research Questions 2 and 3 variables to show a partial association. A logistic regression was tested on research question one (chronic limitations) because it was binary. In addition, the linear regression quantified the association between the predictor and the outcome that might be unique to the predictor and how that might impact the other variables in the model (Hayes, 2013, p. 59). The variables that were used include healthcare satisfaction non-insulin dependent and insulin dependent diabetes participants and self-perception health status with the association of two different groups: FTF educational communication and FTF with alternative forms of educational communication. The linear regression analysis was used if the independent variables predicted the three dependent outcomes in all two research questions. Statistical analyses were completed on SPSS Statistics 24 and began with univariate descriptions of each variable, including measures of central tendency and variation, to understand the composition of the sample under investigation.

Analyses for RQ1

I began analysis for RQ1 by calculating descriptive statistics on the dependent variable (chronic limitations), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a multivariate logistic regression to test the association between type of interaction and odds of reporting a chronic limitation while controlling for each of the demographic variables.

Analyses for RQ2

I began analysis for RQ2 by calculating descriptive statistics on the dependent variable (healthcare satisfaction who are non-insulin dependent), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a simple linear regression to test the association between type of interaction and healthcare satisfaction who non-insulin dependent while controlling for each of the demographic variables.

Analyses for RQ3

I began analysis for RQ3 by calculating descriptive statistics on the dependent variable (healthcare satisfaction insulin dependent diabetes participants), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a linear regression to test the association between type of interaction and healthcare satisfaction while on insulin considering demographic variables as covariates.

Analyses for RQ4

I began analysis for RQ4 by calculating descriptive statistics on the dependent variable (perceived health status), independent variables (FTF and FTF with alternative diabetes communications), and control variables (demographic characteristics: sex, age, race/ethnic background, and education background). The analysis continued with a simple linear regression to test the association between type of interaction and perception of health status while controlling for each of the demographic variables.

Threats to Validity

External Validity

The external validity threats of this study was the population sample of non-institutionalized private citizens that excluded prisoners and soldiers. Generalizability might be a problem since the survey did not represent the entire diabetes population. Another external validity threat was that the sample size was augmented in 32 states by 15% in 2016 to increase the number of states for which reliable state-level estimates could be made (Department of Health and Human Services, 2016). Other issues that could be a threat to validity include random sampling error and unintentional over-or-under representation due to the sampling process. The over sampling procedures, including oversampling and weighting based on race, may create another threat to validity, which might not be threat to validity but have to be mentioned.

Internal Validity

The NHIS secondary data may have some internal threats to validity because these were self-reported data. A possible risk of recall bias exists, and since it was quantitative, the numbers that reflect the answers might not exactly be the correct answers 100% of the time. First, when utilizing the NHIS data, the cross-sectional design to analyze the data for the research study results could not prove a causal relationship. Second, the researcher for the study could not objectively verify the answers to all the questions because the answers were recorded verbally according to the individual's responses (Hayes, 2013). An example would be that the question, "Were you ever told you had diabetes?" was self-reported and not verified from a medical record. The subjective nature of self-reported answers and the degree of over-reporting or under-reporting of the perceived beliefs made it difficult to determine accuracy. An internal validity threat might be based on the correlational design. This linear regression study determined correlation between a criterion variable and the best combination of two or more predictors. To compare the experimental design with the correlation design, the experimental design would require a stronger internal validity.

Ethical Procedures

The researchers for NHIS followed federal law when they collected personal information. The federal law reflects the Public Service Act of 2010, which authorizes the data collection for this database (CDC, 2015d). The NCHS (e.g., agents and contractors) collected personally identifiable NHIS and other data needed. According to federal law, the organization and its affiliates pledge confidentiality and assure that the data will only be used for statistical analysis. The researchers are required to keep the data confidential and maintained without exception according to section 308b of the Public Health Service Act of 2010 and Section 512b of the Confidential Information Protection and Statistical Efficiency Act (Department of Health and Human Services, 2015).

Each individual entering the NHIS study must have signed a consent form before releasing any personal information. In addition, before any potential participants were asked to participate in the study, they were given information concerning to whom the data was given and who can use the data. An important component of this study was maintaining the confidential rights of the participants.

Since the data was already collected, I completed the NHIS application process to gain access to the data. The CDC (2011) is prohibited from dissemination of any information that can identify a participant without his or her consent. Because the secondary data did not have personal identifiers, the data were already anonymous. The reason for using this data in this study was to examine the gaps in the literature, not to generate information for any other reason related to personal benefit or bias.

Before accessing the data, I applied through the IRB to access the data for the research study. My IRB approval number is 02-21-18-0256126. Once permission was received, all data were collected and stored on a secure file to be destroyed after five years. The only individuals with access to the data were the researcher’s dissertation committee and a statistician. The research project utilized NHIS raw data, and the dissemination of the research project findings only on Walden University's secure email and/or Blackboard.

Summary

The secondary data from the NHIS was used in this cross-sectional quantitative study. I used SPSS Statistics 24 to test the hypotheses, bivariate comparison, descriptive linear analysis, and regression analysis. I explored any potential association between chronic limitations, health status, and healthcare satisfaction with (non-insulin dependent) and while on insulin between each form of communication, including alternative with FTF versus FTF with an HCP.

This was a quantitative cross-sectional study that used secondary data from the 2016 NHIS with a sample size of 33,028 civilian non-institutional subjects, in which they found 3,540 individuals who reported having a diabetes mellitus diagnosis (Department of Health and Human Services, 2015). Before starting the data analysis, I seeked and gained approval from the Walden University Institutional Review Board.

This chapter summarized the planned research study and methodology to examine the possible relationship between the different communication avenues with an HCP and how these impact multiple demographic variables. In particular, the examination included the multiple forms of communication with an HCP analyzed variables, such as health care satisfaction insulin dependent and non-insulin participants with diabetes, , self-perception health status, and chronic limitations. Chapter 4 presented the results of the data analysis. Chapter 5 followed, including a discussion of implications and recommendations for future research.

Chapter 4: Results

The purpose of this quantitative, cross-sectional study was to explore whether participants' methods of receiving diabetes communication influenced their chronic limitations, health status, and satisfaction with healthcare with non-insulin-dependent and insulin dependent-participants. The participants had been diagnosed with diabetes mellitus and were over the age of 18-years-old. Data were obtained from the 2016 NHIS. Four hypotheses were established to evaluate the impact of method of diabetes communication on chronic limitations, self-perception of health status, and satisfaction with healthcare among non-insulin dependent and insulin dependent diabetes patients. Several participant demographic factors were also surveyed: age, sex, race/ethnic background, and education. This chapter includes the descriptive statistics for the demographic variables followed by analysis of four research questions.

Demographic Characteristics

I used secondary data collected from the 2016 NHIS for this study. The variables from this dataset were selected based on the research questions. The demographic variables used in the analysis included: age, sex, education background, race/ethnicity, and they were told they had diabetes. Age was categorized by less than 30 years of age, 30–39, 40–49, 50–59, 60–69, 70–79, and 80+. Sex was defined as 0 or 1 (male = 0; females = 1). The three racial groups included for analysis were: White, Black and another racial group. Other racial groups included American Indian and Asians. These racial groups were chosen because there is significant difference in diagnosis rate between Whites and other races.

The categories for education were narrowed to the following: non-high school graduate, high school graduate, some college, no degree, 2-year degree, 4-year degree, and graduate degree. For educational attainment, 28.1% completed high school (*n* = 994), 11.5% completed a 2-year degree (*n* = 407), 13.1% completed a 4-year degree (*n* = 464), and 7.7% have graduate degrees (*n* = 273). To examine type of provider communication, two groups were identified: FTF and FTF with alternatives interaction. FTF plus alternatives included participants who have FTF communication with their providers but also had other forms of communication including chat room, email, or phone call.

The majority of the respondents in the sample were over 60 years old (*n* = 2268, 64%). Most of the sample participants (77.6%, *n* = 2,747) identified as White, 15.7% (*n* = 556) identified as Black, and 6.7% (*n* = 237) identified as another racial group. In terms of interaction type, the majority indicated they have FTF communications (*n* = 2169, 61.3%). Descriptive statistics for age, sex, education level, race/ethnicity, and forms of communication are shown below in Table 5.

Table 5

Frequencies and Percentages of Demographic Characteristics (N = 3,540)

		Frequency	Percent
Sex	Male	1,692	47.8
	Female	1,848	52.2
Age	<30	81	2.3
	30-39	172	4.9
	40-49	308	8.7
	50-59	711	20.1
	60-69	1,106	31.2
	70-79	785	22.2
	>80	377	10.6
Education* Level*	Non-HS-Graduate	726	20.5
	HS Graduate	994	28.1
	Some College	661	18.7
	Two year Degree	407	11.5
	Four Year Degree	464	13.1
	Graduate Degree	273	7.7
Race/Ethnicity	White	2,747	77.6
	Black	557	15.7
	Other	236	6.7
Interaction Type	Face-To-Face	2,169	61.3
	Face-To-Face Plus Interaction	1,371	38.7

Note. * 15 Responses were missing for education variable (*N* = 3,525).

QoL (Chronic Limitations)

The QoL dependent variable was identified as chronic limitation due to diabetes. When the data was analyzed, the data was represented by the following answers: 0 = NIU, 1 = not chronic, 2 = chronic, and 9 = unknown. The data collected was placed into two categories. I discarded the NIU (Not in Universe) responses then determined that unknown responses would be treated as not chronic and then recoded the data so that 0 =

chronic and 1 = not chronic. I excluded these cases because it would not have been real distinction on the chronic limitation variable. Due to the ambiguous definition of NIU, the researchers for this research study determined it would not provide reliable data for this variable.

The universe referred to the participates in the population at risk for a response for the variable in question.. The labeled cases as “NIU” are known as outside the universe for that particular variable question response. (CDC and Prevention and U.S. Department of Health and Human Services, 2016)

The definition of chronic limitations was based on how the questions were asked to the participants by NHIS. The definition was based on the following: a person that was at least 18 years or older with at least one activity limitation while being diagnosed with diabetes and reported having a limitation caused by the following defined condition. The chronic may be defined by having a condition for at least 3 months or longer and was at least diagnosed with the condition at least three months prior to the interview. Those conditions that have not persisted for 3 months are considered acute. The researchers for NHIS noted that some conditions are considered chronic by definition, regardless of the length of time since diagnosis (CDC and Prevention and U.S. Department of Health and Human Services, 2016). For example, the participant may have had the chronic condition for a long time (5 years) without being diagnosed. The participant had numbness in their feet and was not able to walk long distances.

The descriptive statistics of QOL were presented in Table 6. Based on the summary statistics, the percentage was at .815 (*SD* = .388) which indicated that participant responses were leaning toward not chronic. This indicates that majority of the responses (*n* = 2885, 81.5%) were not chronic.

Satisfaction of Healthcare

The satisfaction of health care was reported into three categories. The first question was, satisfaction with healthcare insulin dependent participants. The first table was analyzed health care satisfaction for the diabetes participants on insulin. The categories were best described as 1 = Very Satisfied, 2 = Somewhat Satisfied, 3 = Very Dissatisfied, and 4 = have not had healthcare satisfied. Therefore, a score of 3.5- or higher was a good outcome. The descriptive statistics of satisfaction of healthcare is also presented in Table 6. Based on the summary statistics, the mean score for satisfaction is 1.42 (*SD* = .668). The first question finding indicated that participants were not satisfied with healthcare.

Self-Perception of Health Status

Self-perception of health status was assessed using the following scale: 1 = poor, 2 = fair, 3 = good, and 4 = very good. The descriptive statistics of self-perception of health status a represented in Table 6. Based on the summary statistics, and a mean self-perception of health status score of 3.227 (*SD* = 1.041), respondents perceived themselves to be in good health.

Table 6

Descriptive Statistics of QoL, Satisfaction with health care and perceived Health Status

	N	Minimum	Maximum	Mean	SD
QOL	3540	0.00	1.00	.815	.388
Satisfaction with health care, past 12 mos.	3397	0	4	1.420	.668
Health status	3540	1	5	3.227	1.041

Satisfaction With Healthcare and Perceived Health Status by Gender

The data were stratified by gender to examine differences in the primary dependent variables. By gender, men have slightly higher QoL scores as compared to women. Men and women had about the same level of satisfaction with healthcare for the past 12 months. This indicated that more men than women responded to not having chronic limitations. For health status, men have higher self-perception of health status as compared to women. The results of the comparison by gender are presented in Table 7.

Table 7

QoL, Satisfaction With Healthcare, and Perceived Health Status by Gender

		N	Minimum	Maximum	Mean	SD
Male	QOL	1,692	0.00	1.00	.8262	.37901
	Satisfaction with health care, past 12 mos.	1,627	1	4	1.42	0.666
	Health status	1,692	1	5	2.82	1.036
Female	QOL	1,848	0.00	1.00	.8047	.39657
	Satisfaction with health care, past 12 mos.	1,770	1	4	1.43	0.687
	Health status	1,848	1	5	2.73	1.045

Satisfaction With Healthcare and Perceived Health Status by Race

Regarding race, Whites have higher QOL scores than Blacks and Other racial groups while Blacks have higher satisfaction with healthcare as compared to Whites and other racial groups. This indicated that more Whites responded to not having chronic limitations as opposed to other racial groups. In terms of health status, other racial groups have higher scores than Whites and Blacks. Table 8 presents the results of this analysis.

Table 8

Descriptive Statistics of Study Variables According to Race

		N	Minimum	Maximum	Mean	SD
White	QOL	2,747	0.00	1.00	.8267	.37856
	Satisfaction with health care, past 12 mos.	2,633	1	4	1.41	0.674
	Health status	2,747	1	5	2.82	1.036
Black	QOL	557	0.00	1.00	.7612	.42672
	Satisfaction with health care, past 12 mos.	538	1	4	1.47	0.654
	Health status	557	1	5	2.54	1.044
Other	QOL	236	0.00	1.00	.8051	.39698
	Satisfaction with health care, past 12 mos.	226	1	4	1.42	0.677
	Health status	236	1	5	2.84	1.023

Satisfaction With Healthcare and Perceive Health Status by Education

Participants with higher educational attainment had higher QOL scores. This indicated that participants with higher educational attainment responded to not having chronic limitations. The highest mean for satisfaction with healthcare was observed for no high school diploma participants. Participants with higher educational attainment also had higher health status scores. Table 9 presents the results of this analysis.

Table 9

Descriptive Statistics of Study Variables according to Educational Attainment

		N	Minimum	Maximum	Mean	SD
No High School Diploma	QOL	726	0.00	1.00	.7245	.44706
	Satisfaction with health care, past 12 mos.	672	1	4	1.46	.719
	Health status	726	1	5	2.50	1.066
High School Graduate	QOL	994	0.00	1.00	.8048	.39653
	Satisfaction with health care, past 12 mos.	965	1	4	1.42	.643
	Health status	994	1	5	2.72	1.003
Some college, no degree	QOL	661	0.00	1.00	.8169	.38701
	Satisfaction with health care, past 12 mos.	638	1	4	1.45	.722
	Health status	661	1	5	2.78	1.058
2-year degree	QOL	407	0.00	1.00	.8477	.35979
	Satisfaction with health care, past 12 mos.	396	1	4	1.44	.693
	Health status	407	1	5	2.81	1.045
4-year degree	QOL	464	0.00	1.00	.8879	.31579
	Satisfaction with health care, past 12 mos.	451	1	4	1.39	.662
	Health status	464	1	5	3.06	.977
Graduate degree	QOL	273	0.00	1.00	.9158	.27827
	Satisfaction with health care, past 12 mos.	263	1	4	1.32	.558
	Health status	273	1	5	3.22	.894

Satisfaction With Healthcare and Perceived Health Status by Age Group

Considering the age groups, younger participants have higher QOL scores. This indicated that younger participants have responded to not having chronic limitations as opposed to older participants. Younger participants also had higher satisfaction with healthcare. Participants 40 to 49 years old had the highest health status scores. Results of this analysis are provided in Table 10.

Table 10

Descriptive Statistics of Study Variables by Age Groups

		N	Minimum	Maximum	Mean	SD
<30	QOL	81	0	1	.9383	.24216
	Satisfaction with health care, past 12 mos.	56	1	4	1.59	.757
	Health status	81	1	5	2.94	1.133
30-39	QOL	172	0	1	.8837	.32150
	Satisfaction with health care, past 12 mos.	161	1	4	1.57	.739
	Health status	172	1	5	3.19	1.032
40-49	QOL	308	0	1	.8247	.38086
	Satisfaction with health care, past 12 mos.	295	1	4	1.57	.800
	Health status	308	1	5	3.30	1.065
50-59	QOL	711	0	1	.8158	.38796
	Satisfaction with health care, past 12 mos.	680	1	4	1.50	.752
	Health status	711	1	5	3.34	1.048
60-69	QOL	1,106	0	1	.8092	.39309
	Satisfaction with health care, past 12 mos.	1,077	1	4	1.41	.656
	Health status	1,106	1	5	3.23	1.039
70-79	QOL	785	0	1	.8140	.38934
	Satisfaction with health care, past 12 mos.	764	1	4	1.33	.581
	Health status	785	1	5	3.13	1.010
>80	QOL	377	0	1	.7666	.42357
	Satisfaction with health care, past 12 mos.	364	1	4	1.30	.568
	Health status	377	1	5	3.23	1.030

Study Results

The initial study results used the number of participants who answered that they had been told they had diabetes for the sample because the focus of the study was on participants with diabetes. The data were examined to determine whether there were any differences on each dependent variable (chronic limitations,, satisfaction with healthcare and health status) based on type of diabetes education communication (interaction) the participant received. The following four research questions were addressed:

Research Question 1 (RQ1): Is there an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes?

Research Question 2 (RQ2): Is there an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes?

Research Question (RQ3): Is there an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes?

Research Question (RQ4): Is there an association between type of diabetes education and self-perception health status among individuals with diabetes?

Research Question 1: Modeling Chronic Limitations

I asked Research Question 1, is there an association between the type of diabetes education communication and chronic limitations among individuals diagnosed with diabetes? A logistic regression was performed to answer Research Question 1 in order to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and chromic limitations (chronic vs. non-chronic) among adults diagnosed with diabetes while controlling for age, sex, race/ethnic background and education level. The logistic regression model was statistically significant, $\chi^2(4) = 93.626$, $p < .001$ and a non-significant Hosmer and Lemeshow test verified that the model was well fitting, $\chi^2(8) = 5.13$, $p = .744$. In the first regression model, the covariates age category, sex, race/ethnicity and education level were added to control for the effect of these variables on QoL. In the second model, the interaction type was entered. The dependent variable was "Chronic status of functionally limiting diabetes," where *1 = non-chronic* and *0 = chronic*. The first model (Table 11), including only the control variables and the dependent variable, had three statistically significant variables: race ($p = .011$), age ($p = .021$), and education level ($p < .01$). A person who is white had decreased odds of having chronic limitations compared to a black person (B = -.002, *p*-value = .011). A person with a higher level of education had a decreased chance of having chronic limitations (B = .265, *p*-value < .01). An older person also has increased chance of having chronic limitations (B = -.077, *p*-value = .021).

Model 2 (Table 12) included the control variables as well as the type of diabetes education communication. In the full model, race/ethnic background, education level, and interaction type were found to be statistically significant, but age was no longer significant. A person who is White has decreased odds of having chronic limitations (B = -.002, $p = .026$) compared to a person who is Black or another race. A person who is higher educated has decreased odds of having chronic limitations (B = .228, $p < .01$). After controlling for age, race/ethnic background, and education, a person who has FTF plus alternative interaction has decreased odds of having chronic limitations (B = .335, $p = .002$) when compared with someone who receives only FTF communication. Therefore, there is sufficient evidence to reject the null hypothesis that states there was no association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes. The logistic regression models are presented in Tables 11 and 12.

Table 11

Variables in the Equation for Model 1: Chronic Limitations as Dependent Variable (N = 3540)

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1^a	Age	-.077	.033	5.300	1	.021	.926
	Sex	-.090	.091	.985	1	.321	.914
	Race	-.002	.001	6.389	1	.011	.998
	Educ	.265	.032	68.623	1	.000	1.303
	Constant	1.532	.265	33.388	1	.000	4.628

Note. a. Variable(s) entered on Step 1: Age, Sex, Race, EDUC.

Table 12

Variables in the Equation for Model 2: Chronic Limitations as Dependent Variable

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1^a	Age	-.051	.034	2.167	1	.141	.951
	Sex	-.099	.091	1.182	1	.277	.906
	Race	-.002	.001	4.943	1	.026	.998
	Educ	.228	.034	44.948	1	.000	1.256
	Interaction	.335	.108	9.540	1	.002	1.398
	Constant	1.373	.269	26.036	1	.000	3.947

Note. a. Variable(s) entered on Step 1: Interaction.

Research Question 2: Modeling Healthcare Satisfaction Among Individuals With Diabetes

Research Question 2 asked the following: Is there an association between type of education and healthcare satisfaction among individuals with diabetes? A multiple regression model was performed to address Research Question 2 in SPSS to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and healthcare satisfaction among individuals with diabetes. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations.

The first model included only the control variables of sex, race/ethnicity, age group, and education level. The second block included both the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models (Table 13) were statistically significant: Model 1: $F(4, 3384) = 17.405$, $p < .001$, Model 2: $F(5, 3384) = 13.982$, $p < .001$. However, the inclusion of diabetes education communication did not statistically significantly ($p = .580$) add to the first model (Table 14). In the full model, only age (Beta=-.136, $p = .000$) and education (Beta= -.045, $p = .014$) were statistically significant. An increased age resulted in a higher satisfaction of health care and an increased education level also indicated an increased satisfaction with health care. The coefficients (Table 15) of these variables are negative because the scale of satisfaction ranged from *1 (very satisfied)* to *4 (very dissatisfied)*, thus a decrease in this variable equates with higher satisfaction. Therefore, there was sufficient evidence to accept the null hypothesis that states there was no association between type of education and healthcare satisfaction among individuals with diabetes.

Table 13

ANOVA Test for Regression Model for Healthcare Satisfaction among Individuals with Diabetes (N = 3540)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31.285	4	7.821	17.405	.000[b]
	Residual	1518.917	3,380	.449		
	Total	1550.203	3,384			
2	Regression	31.423	5	6.285	13.982	.000[c]
	Residual	1518.780	3,379	.449		
	Total	1550.203	3,384			

Note. a. Dependent Variable: Satisfaction with health care, past 12 mos.

b. Predictors: (Constant), Sex, Age, EDUC, Race

c. Predictors: (Constant), Sex, Age, EDUC, Race, Interaction

Table 14

Model Summary for Healthcare Satisfaction Among Individuals With Diabetes

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.142[a]	.020	.019	.670	.020	17.405	4	3380	.000	
2	.142[b]	.020	.019	.670	.000	.306	1	3379	.580	1.982

Note. a. Predictors: (Constant), Sex, Age, EDUC, Race

b. Predictors: (Constant), Sex, Age, EDUC, Race, Interaction

c. Dependent Variable: Satisfaction with health care, past 12 mos.

Table 15

Coefficients for Healthcare Satisfaction Among Individuals With Diabetes

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.786	.067		26.485	.000
	Age	-.066	.008	-.133	-7.793	.000
	Race	.000	.000	.024	1.423	.155
	EDUC	-.021	.007	-.049	-2.878	.004
	Sex	-.010	.023	-.008	-.448	.654
2	(Constant)	1.794	.069		26.048	.000
	Age	-.067	.009	-.136	-7.678	.000
	Race	.000	.000	.023	1.363	.173
	EDUC	-.020	.008	-.045	-2.461	.014
	Sex	-.010	.023	-.007	-.432	.665
	Interaction	-.015	.026	-.011	-.553	.580

a. *Note.* Dependent Variable: Satisfaction with health care, past 12 mos.

Research Question 3: Modeling Healthcare Satisfaction Among Individuals on Insulin

Research Question 3 asked the following: Is there an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes? A multiple regression model was performed to address Research Question 3 in SPSS to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and healthcare satisfaction among individuals with insulin dependent diabetes. Only persons on insulin were included in the analysis (n = 1050). The first model included only the control variables of sex, race/ethnicity, age group, and education level. The second model included the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models (Table 16) were statistically significant: Model 1: $F(4, 1050) = 6.232$, $p < .01$, Model 2: $F(5, 1050) = 5.308$, $p < .01$. However, the inclusion of diabetes education communication did not statistically significantly (*p* = .207) add to the first model (Table 17). In the full model, only age (B = -.067, p < .01) and race (B = .001, p = .039) were statistically significant. An increased age resulted in a higher satisfaction of health care. White race resulted in a higher satisfaction score compared to Blacks and other racial groups. (Note: The coefficients (Table 18) of these variables are negative because the scale of satisfaction ranged from *1 (very satisfied)* and *4 (very dissatisfied)*, thus a decrease in this variable equates with higher satisfaction). There was sufficient evidence to accept the null hypothesis that stated that there was no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes, The results of the regression analysis are presented in Tables 16 to 18.

Table 16

ANOVA Test for Regression Model of Healthcare Satisfaction Among Individuals With Diabetes While on Insulin (n = 1056)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.691	4	2.923	6.232	.000[b]
	Residual	490.535	1,046	.469		
	Total	502.226	1,050			
2	Regression	12.440	5	2.488	5.308	.000[c]
	Residual	489.787	1,045	.469		
	Total	502.226	1,050			

Note. a. Dependent Variable: Satisfaction with health care, past 12 mos.
b. Predictors: (Constant), Sex, Age, EDUC, Race
c. Predictors: (Constant), Sex, Age, EDUC, Race, Interaction

Table 17

Model Summary of Healthcare Satisfaction Among Individuals With Diabetes While on Insulin

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.153[a]	.023	.020	.685	.023	6.232	4	1046	.000	
2	.157[b]	.025	.020	.685	.001	1.597	1	1045	.207	1.961

Note. a. Predictors: (Constant), Sex, Age_Recode, EDUC_recode, Race_Recode
b. Predictors: (Constant), Sex, Age_Recode, EDUC_recode, Race_Recode, HCP
c. Dependent Variable: Satisfaction with health care, past 12 mos.

Table 18

Coefficients of Healthcare Satisfaction Among Individuals With Diabetes While on Insulin

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.644	.123		13.393	.000
	Age	-.067	.015	-.134	-4.356	.000
	Race	.001	.000	.068	2.224	.026
	EDUC	.003	.014	.007	0.213	.831
	Sex	.005	.042	.003	.114	.909
2	(Constant)	1.683	.126		13.302	.000
	Age	-.072	.016	-.144	-4.536	.000
	Race	.001	.000	.064	2.070	.039
	EDUC	.009	.015	.020	0.619	.536
	Sex	.005	.042	.004	.116	.908
	Interaction	-.060	.047	-.043	-1.264	.207

Note. a. Dependent Variable: Satisfaction with health care, past 12 mos.

Research Question 4: Modeling Self-Perception Health Status

Research Question 4 asked the following: Is there an association between type of diabetes education and self-perception health status among individuals with diabetes? A multiple regression model was performed to address Research Question 4 in SPSS to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and self-perception health status among individuals with diabetes. The first model included only the control variables of sex, race/ethnicity, age group, and education level. The second block included both the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models (Table 19) were statistically significant: Model 1: $F(4, 3524) = 39.875$, $p < .001$, Model 2: $F(5, 3524) = 32.450$, $p < .001$. However, the inclusion of diabetes education communication did not statistically significantly ($p = .102$) add to the first model (Table 20). In the full model, race (B = .001, $p = .015$) and education level were both statistically significant (B = -.124, $p < .01$; Table 21). Being Black or other racial group was associated with an increase in perceived health status and people with a higher educational attainment category had a lower level of perceived health status (lower level meaning a poorer reported health status). Therefore, there was sufficient evidence to accept the null hypothesis that stated there was no association between type of diabetes education and self-perception health status among individuals with diabetes.

Table 19

ANOVA Test for Regression Model for Health Status

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	165.254	4	41.313	39.875	.000^b
	Residual	3646.997	3,520	1.036		
	Total	3812.251	3,524			
2	Regression	168.025	5	33.605	32.450	.000^c
	Residual	3644.226	3,519	1.036		
	Total	3812.251	3,524			

Note. a. Dependent Variable: Health Status
b. Predictors: (Constant), Sex, Age, EDUC, Race
c. Predictors: (Constant), Sex, Age, EDUC, Race, Interaction

Table 20

Model Summary for Health Status

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.208[a]	0.04335	0.04226	1.01788	0.0433481	39.8748	4	3520	1E-32	
2	.210[b]	0.04408	0.04272	1.01764	0.000727	2.67612	1	3519	0.102	2.049

Note. a. Predictors: (Constant), Sex, Age_Recode, EDUC_recode, Race_Recode
b. Predictors: (Constant), Sex, Age_Recode, EDUC_recode, Race_Recode, Interaction
c. Dependent Variable: Health Status

Table 21

Coefficients for Health Status

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.506	.098		35.831	.000
	Age	-.019	.012	-.025	-1.522	.128
	Race	.001	.000	.043	2.603	.009
	EDUC	-.132	.011	-.198	-11.951	.000
	Sex	.062	.035	.030	1.797	.072
2	(Constant)	3.535	.099		35.539	.000
	Age	-.024	.013	-.032	-1.865	.062
	Race	.001	.000	.041	2.444	.015
	EDUC	-.124	.012	-.186	-10.415	.000
	Sex	.064	.035	.031	1.851	.064
	Interaction	-.064	.039	-.030	-1.636	.102

Note. a. Dependent Variable: Health Status

Summary

The researcher’s purpose of this study was to investigate the relationships between participants’ methods of receiving diabetes communication and chronic limitations, health status and satisfaction with healthcare with non-insulin dependent and insulin dependent diabetes, after controlling for race/ethnicity, age, sex, and education level. The first research question investigated if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and chromic limitations (chronic vs. non-chronic) among adults diagnosed with diabetes while controlling for age, sex, education level and race/ethnicity. The logistic regression model was statistically significant. The first model, including only the control variables, had three statistically significant variables: race/ethnicity, age, and education level. A person who was white had decreased odds of having chronic limitations compared to a person of a different race. A person with a higher level of education had a decreased chance of having chronic limitations. An older person also has increased chance of having chronic limitations. Model 2 included both the control variables as well as the type of diabetes education communication. Race, education level, and interaction type were found to be statistically significant. A person who was white has decreased odds of having chronic limitations. A person who had higher educated has decreased odds of having chronic limitations and a person who has FTF plus alternative interaction has decreased odds of having chronic limitations. There was sufficient evidence to reject the null hypothesis that stated there was no association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

A multiple regression model was performed to address research question 2 to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and healthcare satisfaction among individuals with diabetes. The first model included only the control variables of sex, race/ethnicity, age group, and education level. The second model included both the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models were statistically significant, but the inclusion of diabetes education communication was not statistically significantly add to the first model. In the full model, only age and education were statistically significant. An increased age resulted in a higher satisfaction of health care and an increased education level also had an increased satisfaction with health care. There was sufficient evidence to accept the null hypothesis that states there was no association between type of education and healthcare satisfaction among individuals with diabetes.

A multiple regression model was performed to address research question 3 to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and healthcare satisfaction among individuals with insulin dependent diabetes. The first model included only the control variables of sex, race/ethnicity, age group, and education level. The second model included both the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models were statistically significant, but the inclusion of diabetes education communication did not statistically significantly add to the first model. In the full model, only age and race were statistically significant. An increased age among insulin dependent diabetes participants resulted in a higher satisfaction of health care. Also, White insulin dependent diabetes participants reported higher satisfaction with healthcare than Blacks and members of other racial groups dependent on insulin. There was sufficient evidence to accept the null hypothesis that stated that there was no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes participants.

A multiple regression model was performed to address research question 4 to determine if there was a significant relationship between the type of diabetes education communication (FTF versus FTF plus alternatives) and self-perception of health status among individuals with diabetes. The first block (model) included only the control variables of sex, race/ethnicity, age group and education level. The second block included both the control variables as well as the type of diabetes education communication (FTF versus FTF plus alternatives). Both models were statistically significant, but the inclusion of diabetes education communication did not statistically significant add to the first model. In the full model, race and education level were both statistically significant. Being Black or other racial group, was associated with an increase in self-reported health status whereas higher educational attainment was associated with a lower level of perceived health status. There was sufficient evidence to accept the null hypothesis that stated there was no association between type of diabetes education and self-perception health status among individuals with diabetes.

Chapter 5 will begin by revisiting the problem statement and nature of study. The chapter will continue to address the interpretation of findings, limitations of study, recommendations, and implications for social change. Analysis of theoretical models in reference to my research questions will also be provided.

Chapter 5: Summary, Conclusions, and Recommendations

Introduction

Diabetes is a serious health problem in the United States. According to the CDC (2014a), from 1980 to 2012, the number of people diagnosed with diabetes in the United States significantly increased. From 5.5 million diagnosed individuals, it reached 21.3 million (CDC, 2017). On a yearly basis, about 1.7 million new cases of diabetes are reported among the adult population. If the trend continues, by 2050, 1 out of 3 adults in the United States will have diabetes (CDC, 2017).

Diabetes is one of the major contributors to heart disease and stroke (CDC, 2014a). Researchers have associated several risks with developing T2DM, such as overindulging or poor nutrition, physical inactivity, and obesity (CDC, 2014a). When diabetes is left untreated, undiagnosed, or poorly controlled, it can result in destructive irreversible complications such as kidney failure, visual impairment blindness, heart attack, lower limb amputation, stroke, and erectile dysfunction (CDC, 2014a). Self-management education is vital in assisting people with diabetes because they need to make multiple decisions daily about balancing food, physical activity, and medication, as well as blood sugar monitoring and insulin injections (AADE, 2008).

Individuals who are diagnosed with diabetes need self-management skills to take care of themselves to understand how diabetes affects their own health outcomes (Ryan et al., 2013). Individuals must learn self-management skills from a HCP or a CDE, so these individuals understand the benefits of self-management for better health outcomes (ADA, 2016). Social media and websites have become popular among all Internet users;

about 80% of users have proactively searched for health solutions (e.g., treatments for a specific disease) online (Lu et al., 2013). However, there was limited literature that addressed credible alternative Internet-based education, phone calls, emails, or texts and how the traditional sessions influenced the patient's QoL (Rosal et al., 2014).

The problem that I addressed in this study was that current self-perception of health status, chronic limitations, and satisfaction with healthcare were not known to change in the virtual world setting when FTF was complemented with additional support from technology (Rosal et al., 2014). Individuals with diabetes might receive several types of education. Their chronic limitations, self-perception of health status, or healthcare satisfaction might change depending on the type of diabetes education and their demographic groups (age, sex, education, and race/ethnic background). However, only a few published studies addressed these components (Rosal et al., 2014).

The purpose of this quantitative, cross-sectional study was to determine if there was a difference in the association between diabetes communication type (FTF diabetes communication verses FTF with support of an alternative form of education including texts, chat rooms, and emails) and chronic limitations, self-perception of health status, and satisfaction with healthcare for non-insulin-dependent and insulin-dependent diabetes participants. Several demographic characteristics were also included, such as education, age, gender, and race/ethnic background. The target population for the 2016 NHIS was all noninstitutionalized individuals over the age of 18-years-old living in the United States. NHIS 2016 was the source of data for this study. A total sample of 3,540 individuals was used in the survey completed by NHIS. The independent variables included form of communication with an HCP additional covariate that included age, education, race, and gender. The dependent variables consisted of diabetic participant's chronic limitations, self-perceived health status, and health care satisfaction for non-insulin dependent and insulin dependent (diabetics).

The following research questions were used to achieve the goal of the study:

Research Question 1 (RQ1): Is there an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes?

Null Hypothesis ($H_0$1): There is no association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Alternative Hypothesis (H_a1): There is an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Research Question 2 (RQ2): Is there an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes?

Null Hypothesis ($H_0$2): There is no association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Alternative Hypothesis (H_a2): There is an association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Research Question (RQ3): Is there an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes?

Null Hypothesis ($H_0$3): There is no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Alternative Hypothesis (H_a3): There is an association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Research Question (RQ4): Is there an association between type of diabetes education and self-perception health status among individuals with diabetes?

Null Hypothesis (H_04): There is no association between type of diabetes education and self-perception health status among individuals with diabetes.

Alternative Hypothesis (H_a4): There is an association between type of diabetes education and self-perception health status among individuals with diabetes.

The sample reflected participants with self-reported diabetes and the dependent variables of satisfaction with healthcare non-insulin-dependent and insulin-dependent, self- perception of health status, and chronic limitations.

The theory used to guide this study was SCT. Other theories, such as HBM, were explored to explain how individuals changed their behaviors after they received diabetes education. SCT was used to examine exactly how communication affected patients and their outcomes.

Demographic information on age, sex, education background, and race/ethnic background were collected for the study. The participants have an equal split in gender, with women making up more participants by less than 5%. The majority of the participants (over 70%) were 50 years old and above. Regarding education, high school graduates equated to 28.1%, and non-high school graduates equated to 20.5% of the population. White Americans accounted for the majority of the participants with 77.6% of the population.

Results on the tests was completed to identify the relationship between the type of diabetes education communication and chromic limitations among adults diagnosed with diabetes, while controlling for age, sex, education level, and race, indicated there were significant variables. Race ($p = .011$), age ($p = .021$), and education level ($p < .01$) were significant variables in relation to chronic limitations. A person who was White or had a high level of education had a decreased change of living with chronic limitations, but an older adult had an increased chance of having chronic limitations. When including the type of education communication, race ($p = .026$), education level ($p < .01$), and education communication type ($p =.002$) were found to be statistically significant.

For healthcare satisfaction among individuals with diabetes, only age and education were statistically significant ($p < .001$). As age increased, it resulted in higher satisfaction and an increase in education level, as well as increased satisfaction with health care. The results for health care satisfaction among individuals with diabetes while on insulin indicated that only age ($p < .01$) and race ($p = .039$) were statistically significant. The increase in age resulted in a higher satisfaction with health care, and White individuals registered a higher satisfaction compared to Black individuals and other racial groups.

The results for the self-perception health status among individuals with diabetes showed that race and education level were both statistically significant. An increase in self-reported health status was attributed to being Black or belonging to another racial group. A higher educational attainment had a lower level of health status, which meant a poorer reported health status.

Interpretation of Findings

RQ1: Is There an Association Between the Type of Diabetes Education Communication and Chronic Limitations Among Adults Diagnosed With Diabetes?

Based on the findings, race/ethnic background, age, and education were significant variables. A person who was White had lower chances of living with a chronic limitation. Similarly, those with higher levels of education had lower likelihood of living with chronic limitations, but those participants who were older had more chronic limitations. Results also showed that the type of education was significant, resulting in rejection of the null hypothesis, and accepting the alternative hypothesis. There was an association between the type of diabetes education communication and chronic limitations among adults diagnosed with diabetes.

Some previous studies showed results that were consistent with the findings identified in the current study. Siminerio et al. (2014) found that alternative forms of diabetes education, such as telemedicine, telehealth, and web-based platforms, were effective in rural areas. Results showed that these alternative forms significantly influenced the behavioral and psychological outcomes and patient satisfaction of participants. Diabetes self-management support using a diabetes specialist team is challenging in rural areas. In this team approach, more than one type of HCP provides education to the patient; the team typically includes a CDE, registered dietitian, physician, physical therapist, and pharmacist.

Researchers have studied Internet-based diabetes self-management education (Pereira et al., 2015), but there were limited free sites offering diabetes resources, communication, and webinars. Welch et al. (2015) compared two platforms for diabetes management by focusing on urban Latino populations. The group using Internet-based platforms had lower A1C levels compared to the traditional diabetes care group, and they had lower diabetes distress and lower social distress during the follow-up (Welch et al., 2015).

Diabetes health education might be a vital factor in helping create positive behavioral changes in diabetes management (White et al., 2015). Internet-based tools need more investigation as different avenues to change behavior. Particularly, using these tools may have a considerable impact on more vulnerable populations (such as those with low socioeconomic status, people who live in rural areas, and individuals with languages other than English) with diabetes. The impact on health outcomes may be more substantial for this population because numerous barriers may be applied to these groups of people. The need for more quality communication with their HCPs can help them obtain higher treatment satisfaction and lower medication nonadherence (White et al., 2015).

Diabetes Care conducted a review of computer-based interventions to improve self-management in adults with T2DM (Pal et al., 2014). Based on the Diabetes Care studies, there was little benefit to computerized interventions regarding glycemic control, as measured by A1C, but the mobile phone-based interventions showed a larger numerical effect (Tildesley et al., 2014). This analysis of the individual studies confirmed that using alternative forms of education and communication might improve blood sugar control, health status, and satisfaction with healthcare (Tildesley et al., 2014).

However, Greenwood et al. (2014) found a different result. In Greenwood et al.'s study on the alternate ways of developing diabetes self-management education, such as telephone and secure messaging, they found no significant differences in the health outcomes of patients. Contrary to what was identified in the Greenwood et.al. (2014) study, changing the type of education did not influence health outcomes.

Researchers have identified race as a significant factor contributing to the outcomes of patients. Jack et al. (2014) explained that different support across customs and cultures influenced behavior. Depending on the culture, individual patients might have significantly different values, norms, and perspectives (Jack et al., 2014). As such, diabetes education should be culturally appropriate to serve people with diabetes or those at risk of developing diabetes.

RQ2: Is There an Association Between Type of Education and Healthcare Satisfaction Among Individuals With Non-Insulin Dependent Diabetes?

Results showed that only age and education were statistically significant. The increase in age or educational level led to increased satisfaction with health care. The null hypothesis was accepted. There was no association between type of education and healthcare satisfaction among individuals with non-insulin dependent diabetes.

Greenwood et al. (2014) had similar findings. They did not find any relationship between alternative ways of education and health outcomes with patients with diabetes. Alternative ways of developing DSME, such as telephone and secure messaging, were not significant to improve health outcomes (A1C and diabetes complications). Mitchell et al. (2014) also found that there was no significant difference in the groups' diabetes health outcomes after an 8-week study. Satisfaction with diabetes education in both of the groups was similar, and 80% of the participants in both groups stated they would recommend diabetes education after the study (Mitchell et al., 2014).

Patel et al. (2015) investigated whether patients changed their negative attitudes toward insulin injections after they and their HCPs viewed a well-planned out DVD on the subject. The study showed a decrease in negative attitudes. The change in attitude might lessen the stress a patient could have with an insulin injection and help him or her better understand the need for the insulin. The patient's adherence to insulin injections would create a better health outcome due to better blood sugar control and a better overall health status, even though the education delivery was not FTF.

Through a sponsored review of computer-based interventions to improve self-management in adults with T2DM by Diabetes Care, Tildesley et al. (2014) identified little benefit occurred from computerized interventions in glycemic control, but mobile phone-based interventions demonstrated a greater numerical effect. The analysis of individual research studies showed that using alternative forms of education and communication might improve blood sugar control, health status, and satisfaction with healthcare (Tildesley et al., 2014).

Sheibe et al. (2015) explained that some of the new recommendations involved having alternative sessions online and more communications with patients via texting or phone calls, social media support, and webinars at no cost for the patients. These options could help patients develop better self-management skills (Bond et al., 2010; Prezio et al., 2014). As a result, they would have better blood sugar control, greater satisfaction with healthcare, and better health status. The alternative ways of communicating with patients influence behavior for the good of the patient. However, there has been limited support for this approach from HCPs.

RQ3: Is There an Association Between Type of Education and Healthcare Satisfaction Among Individuals With Insulin Dependent Diabetes?

Findings showed that only age and race/ethnic background were the only significant variables in relation to healthcare satisfaction while on insulin. An increased age resulted in a higher satisfaction of health care. Whites registered a higher satisfaction compared to Blacks and other racial groups. From the results, the null hypothesis was accepted. There was no association between type of education and healthcare satisfaction among individuals with insulin dependent diabetes.

Similarly, with Research Question 2, researchers had the same findings as the current study. Greenwood et al. (2014) showed similar findings that indicated alternate ways of developing DSME, such as telephone and secure messaging had no significant differences in health outcomes (A1C and diabetes complications). Based on Mitchell et al.'s (2014) findings, there was no significant difference in the groups' diabetes health outcomes. Satisfaction with diabetes education in both of the groups was similar (Mitchell et al., 2014).

However, Siminerio et al. (2014) found that alternative forms of diabetes education, such as telemedicine, telehealth, and web-based platforms, in a rural area made a significant influence on behavioral outcome and patient satisfaction. Some researchers have studied Internet-based diabetes self-management education (Pereira et al., 2015). However, few existed on free Internet sites offering diabetes resources, communication, and webinars.

There are numerous benefits for diabetes patients who can access and use information at their leisure (Pereira et al., 2015). Welch et al. (2015) compared two platforms for diabetes management to focus on urban Latino populations. The group using Internet-based platforms had lower A1C levels compared to the traditional diabetes care group, and they had lower diabetes distress and lower social distress at follow-up (Welch et al., 2015).

The results of a systemic review on computer-based interventions to improve self-management in adults with T2DM (Pal et al., 2014) showed little benefit to using computerized interventions in glycemic control, as measured by A1C. However, the mobile phone-based interventions indicated a larger numerical effect (Tildesley et al., 2014). The analysis of the individual studies showed that using alternative forms of education and communication might improve blood sugar control, health status, and satisfaction with healthcare (Tildesley et al., 2014).

Several scholars have mentioned the need for more research focusing on alternative methods of diabetes education for patients (Hunt, 2015; Raidi & Safaii, 2015). Bond et al. (2010) and Prezio et al. (2014) suggested using alternative education, such as sessions online, more communications with patients via texting or phone calls, social media support, and webinars at no cost for the patients, to develop better self-management skills. As a result, patients would have better blood sugar control, greater satisfaction with healthcare, and better health status. These alternative ways of communication influence behaviors for the good of the patient (Bond et al., 2010; Prezio et al., 2014).

RQ4: Is There an Association Between Type of Diabetes Education and Self-Perception Health Status Among Individuals With Diabetes?

Based on the findings, race/ethnic background and education level were both statistically significant. Being Black or other racial group increased self-reported health status. Individuals with a higher educational attainment showed lower level of health status that pertained to lower level meaning a poorer reported health status. The null hypothesis was also accepted. There was no association between type of diabetes education and self-perception health status among individuals with diabetes.

Greenwood et al. (2014) showed no significant differences in health outcomes (A1C and diabetes complications) occurred for using alternate ways of developing DSME, such as telephone and secure messaging. These results were consistent with what was identified in the study: There was no relationship between education type and health outcomes and perceptions. Mitchell et al. (2014) also found no significant difference in the groups’ diabetes health outcomes.

Researchers have studied Internet-based diabetes self-management education (Pereira et al., 2015). However, few were on free Internet sites offering diabetes resources, communication, and webinars. Researchers have presented numerous benefits for diabetes patients who can access and use information at their leisure (Pereira et al., 2015). Welch et al. (2015) compared two platforms for diabetes management to focus on urban Latino populations. The group using Internet-based platforms had lower A1C levels compared to the traditional diabetes care group, and they had lower diabetes distress and social distress at the follow-up (Welch et al., 2015).

Sheibe et al. (2015) suggested having alternative sessions online, more communications with patients via texting or phone calls, social media support, and webinars at no cost for the patients, to develop better self-management skills (Bond et al., 2010; Prezio et al., 2014). Then, patients would have better blood sugar control, greater satisfaction with healthcare, and better health status. These alternative ways of communication influence behaviors for the good of the patient, yet there have been few endorsements from HCP to support this movement. Several scholars have mentioned the need for more research focusing on alternative methods of diabetes education for patients, given the barriers to attending FTF sessions with an HCP (Hunt, 2015; Raidi & Safaii, 2015).

Alternative forms of diabetes education, such as telemedicine, telehealth, and web-based platforms, were assessed in rural areas. These significantly influenced behavioral and psychosocial outcomes, as well as patient satisfaction (Siminerio et al., 2014). Based on the review of literature completed by Pal et al. (2014), there was little benefit to using computerized interventions in glycemic control, as measured by A1C; however, the mobile phone-based interventions indicated a larger numerical effect (Tildesley et al., 2014). This analysis of the individual studies confirmed that using alternative forms of education and communication might improve blood sugar control, health status, and satisfaction with healthcare (Tildesley et al., 2014).

Limitations of the Study

There were several limitations encountered in the study. One of the limitations was the use of secondary data due to its time validity. The results of the study were limited to when it could be applied with secondary data. As such, it might not hold true for any point of time prior or after the specific time utilized from the secondary source of data.

The secondary data could also include some bias given the approach used to collect data. The answers might not have included completely honest responses from the participants (CDC, 2015d). However, using NHIS was found to show “health and disease, despite the limitation of recall bias and participants’ reluctance to be forthcoming regarding diabetes” (Parsons et al., 2014, p. 20).

Another limitation was using data of records from households and individuals from public use files of 2016 NHIS. Despite the number of population used for the study, the samples might not have been enough for the subpopulations. In addition, one limitation was the geographical area used for the survey used as secondary data for the study. As such, the data were limited to where the survey was administered. Generalization was also difficult due to the various limitations presented.

Recommendations

This study focused on the exploring whether participants' methods of receiving diabetes communication influenced a person's chronic limitation levels, health status, and satisfaction with healthcare, and for insulin dependent diabetes participants. The study included participants diagnosed with Diabetes Mellitus over the age of 18-year-old utilizing 2016 NHIS data set. Based on the literature and findings, there are other aspects of this topic that can be explored. Future researchers can consider the following recommendations to explore the topic further.

The study did not consider the geographic location, given the limitation from using secondary data. Future researchers can explore using primary data by conducting a survey and including the geographic location of participants. Through this approach, the limitations from using secondary data will be mitigated. Moreover, the study can be expanded by including another demographic factor to contribute to the results in the literature.

Another aspect that can be explored is to compare results between two different demographic factors. The study has already explored differences between race, age, and educational level and how these influenced the results regarding healthcare satisfaction, self-perception, and chronic limitations. Conducting the same level of study on geographic location may prove helpful in further contributing to existing literature on the topic.

Another area that can be explored is using a mixed methods study. Future researchers can explore is expanding the scope of study to include the perceptions of patients with diabetes. Through a mixed methods approach, future researchers can explore an underserved area: the perception of patients with diabetes on alternative types of education regarding health outcomes, their level of satisfaction with health care, and self-perception. Future researchers can obtain a more in-depth view of how alternative types of education contribute to one's overall satisfaction and outcomes. Future researchers can better understand the approach that is most beneficial to patients with diabetes.

Implications/Social Change

The results of the study may have implications on different stakeholders. The outcome of the study reinforced some of the findings from the previous studies that showed the importance of using alternative types of education for patients with diabetes. However, this study also provided different results regarding health outcomes and satisfaction of patients who participated in alternative types of education; therefore, there was no significant relationship between health care satisfaction and alternative types of educations, but previous studies showed that a significant relationship existed.

Despite the varying results, this study can positively influence HCPs. The results may prompt HCPs to rethink the way they communicate with their patients who were diagnosed with diabetes, thereby increasing the patients QoL and decreasing living with chronic limitation due to diabetes. HCPs must understand the different barriers resulting to poor quality of information about diabetes due to costs of visits, time, and transportation to and from visits. Alternative forms of communication, such as phone, web, chat rooms, or email messages, may be needed to help decrease the barriers to education. While the results of the study showed no relationship between health care satisfaction and alternative type of communication, these did have a significant relationship with chronic limitation and would be beneficial if patients received the proper education to limit worsening their conditions.

Regarding practice, healthcare or patient satisfaction can shift during the progression of the treatment and condition. The satisfaction with healthcare may be directed to their physician and not the whole experience (Fenton et al., 2012). While results were not as expected—health care satisfaction and self-perception were not significantly related to type of education—these findings remained beneficial for HCPs; the study showed how demographic factors related to healthcare satisfaction. This finding can help them better understand and rethink approaches to offer better care to patients. The outcome of this study can also guide the HCP to consider providing more alternative forms of communication (e.g., education).

Given the influence of HCPs on the opinions of patients, employees, and fellow members of committees and associations, HCPs can affect how the members of the community perceive beliefs about health, and about how and why one must gain additional information or education about a disease, such as diabetes, heart disease, or cancer (AADE, 2016). Most physicians and HCPs are not open to introducing alternative types of education to their patients. As such, studies like this one are important to provide HCPs with more information on what benefits can be derived from using alternative forms with FTF. Given the right mindset and approach on supplementing alternative forms of education, patients with diabetes may receive correct information to manage their condition.

The identification of the association between the type of education and the demographic group of individuals with diabetes can help HCPs provide better programs that are fit to a specific group. HCPs can create a tailored fit program to cater to the preference of individuals with diabetes, thereby decreasing diabetes related health issues. They can implement more alternative educational programs for participants.

Conclusion

Diabetes is one of greatest epidemics today in the world. There has been a dramatic increase in the number of individuals with diabetes from 1980 to 2012. If the trend continues, 1 out of 5 adults in the United States will have diabetes by 2050. Self-education is vital for people diagnosed with diabetes, so they can manage their conditions and prevent these from further developing. There are many barriers resulting in individuals with diabetes receiving limited education about the disease. To addresses these barriers, alternative forms of education are being explored and suggested. However, there is limited study on using alternative forms to supplement FTF education.

The purpose of this quantitative, cross-sectional study was to explore the association between diabetes communication type (FTF diabetes communication verses FTF with support of an alternative form of education including texts, chat rooms, and emails) and chronic limitations, self-perception of health status, and satisfaction with healthcare for non-insulin dependent and insulin dependent diabetes participants. Results showed that type of education was only significantly to chronic limitations. Some of the demographic factors were related to chronic limitations, self-perception of health status, and satisfaction with healthcare.

The findings of the study are beneficial to individuals with diabetes and HCPs. The results may help HCPs create and explore a tailored fit education program depending on the preferences of individuals with diabetes, as well as in association to their demographics to chronic limitations, satisfaction with healthcare, and self-perceptions. One of the areas that future researchers can explore involves expanding the study to use a mixed method approach to understand the perceptions of individuals with diabetes.

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Appendix A: Application to IHIS DATA

All information on this form will be kept confidential.

All information on this form is required for registration unless otherwise indicated by*.

Personal Information

First Name ________________________

Last Name ________________________

Institution ____ Teacher or professor

____ Colleague

How did you learn about

IPUMS? _____Journal article or other publication using the data

_____ Exhibit or workshop at an academic conference

_____ Other: _______________

_____ Public Health

_____ Public Policy

_____ Medicine or clinical research

_____ Demography

_____ Statistics

Field _____ Sociology

_____ History

_____ Other, academic_____________

_____ Government

_____ News Media

_____ Other, nonacademic

_____ Faculty

______ Academic researcher

Status ______ Academic staff

______ Postdoctoral

______ Student, graduate

______ Student, undergraduate

______ Student, high School

______ Other, academic___________

______ Other, nonacademic__________

______ Research article or chapter

______ News article

______ Policy report

Anticipated results ______ Thesis, doctoral

of research ______ Thesis, other

______ Class assignment

______ Teaching material

______ Book

______ Other________________

Data Use Restrictions-Read Carefully

The Public Health Services Act (Section 308 (d) provides that the data collected by the National Center for Health Statistics (NCHS), Center for Disease Control and Prevention (CDC), may be used only for the purpose of health statistical reporting and analysis. Any effort to determine the identity of any reported case is prohibited by this law. NCHS does all it can to assure that the identity of data subjects cannot be disclosed. All direct identifiers, as well as any characteristics that might lead to identification, are omitted from the data files. Any intentional identification or disclosure of a person or establishment violates the assurances of confidentiality given to the providers of the information.

Therefore, users will:

1. Use the data in these data files for statistical reporting and analysis only.
2. Make no use of the identity of any person or establishment discovered inadvertently and advise the Director, NCHS, of any such discovery (301-458-4500).
3. Not link these data files with individually identifiable data from other NCHS or non-NCHS data files.

By using data, you signify your agreement to comply with the above-stated statutorily-based requirements.

Research Project

Please provide at least 25 words describing your research project or how you plan to use the data.

Limitations of the data and conditions of use

Please check all of the following boxes to indicate that you have read about the limitation of the IHIS data and you agree to abide by the conditions of use.

Use agrees to receive occasionally email messages.

e Minnesota Population Center may contact you via email addresses given above for communications related to the IHIS data system. Such messages will infrequent, and we will safeguard the confidentiality of your email address.

Use the data in these data files for statistical reporting and analysis only

Make no use of the identity of any person or establishment discovered inadvertently and advise the Director of NCHS of any such discovery (301-458-4500)

Do not link these data with individually-identifiable data from NCHS or non-NCHS data files

No fees may be charged for use or distribution of the data

All persons are granted a limited license to use and distribute these data, but you may not charge a fee for the data if you distribute them to others.

Cite the IHIS appropriately

Publications and research reports based on the database must cite it appropriately.

IHIS cannot be used to study small geographic areas

The smallest geographical areas identified in the IHIS are regions (groups of states) and a limited number of metropolitan areas.

This system provides individuals-level data only

You will need a statistical software package, such as STATA, SAS, or SPSS, to analyze the downloaded data. Alternatively, you may use the IHIS-SDA online tabulator to make tables, without making a data extract.